

TO TABLETS

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- Windows and others
- Choices, choices, choices
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- Tablet Hardware guide
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TABLETS

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CREDITS

The people behind this book

EDITORIAL

Executive Editor

Robert Sovereign-Smith

Writers

Avinash Kothuri,
Hardik Kotecha,
Harmanpreet Singh,
Paanini Navilekar,
Radhika Dimri,
Subodh Kolhe

Copy Desk

Infancia Cardozo,
Siddharth Parwatay

DESIGN

Sr. Creative Director

Jayan K Narayanan

Art Director

Anil VK

Associate Art Director

Atul Deshmukh

Sr. Visualiser

Manav Sachdev

Visualisers

Prasanth TR & Anil T

Chief Designer

Baiju N.V

Contributing Designer

Vijay Padaya

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Introduction

Tablets need no introduction. If you're into tech, you've no doubt been bombarded with ads for tablets. The world's gone portability crazy – what started as simple browsing on your dumb-phone has now transmogrified into an app crazy, bandwidth hungry, touch-enabled world of its own. What the iPhone started, has moved on to become the touchy-feely world of people going ga-ga over tablets. However, most people still believe that the iPad was the first “tablet”, and that the tooth fairy leaves money under your pillow as a reward for spitting out milk teeth... We're here to debunk one of these beliefs, and set you straight with knowledge that you should pass on.

As with anything that's “hot”, just as it happened with mobile phones before this, everyone's jumped on the tablet bandwagon. Now we've got tablets for as cheap as 6K, all the way up to the iPads of the world, and none of them can really hold a candle to the productivity that a laptop or desktop offers – but that's not what you're really looking for when you think “tablet” are you? There's just something to be said for the touch interface that Apple has popularised again, and even kids as young as 3 will vouch for that. It's the natural way of doing things – maybe not editing Excel files, but certainly when browsing through pictures, or even playing “casual” games.


This Fast Track starts you off slow – looking at where it all began, and why it didn't really take off all those years ago. Obviously, it also covers Apple, and the iPad, because honestly, that's the benchmark we all use to decide on whether a device from another manufacturer is really that good. Apple might have had a stranglehold on the touch-based device market if it wasn't for the entrance of Google's offering. Thus we will cover Android and all the major devices that were made possible because of it – which is also why you're so spoiled for choice these days. what Android also did, since it's open source, is open up the world of tablets to the “little guy”,

and if there's one thing we love at Digit it's the little guy, because it's the little guys that keep the bigger ones on their toes, and keeps them honest.

Microsoft, who was perhaps one of the first to target the tablet platform with Tablet Editions of their Windows OS, way back when, is actually left playing catch-up with in the tablet space, but to ever rule them out of a race would be idiotic, based on past experiences. There are others as well, RIM and their BlackBerry PlayBook may not have got it right the first time around, but in no way can they be written off either. Amazon's Kindle Fire – which recently became the highest selling Android Tablet from all manufacturers – has shown us that tablets are a serious business, and they don't necessarily have to cost an arm and a leg to offer a great experience.

That's just the big guys though; with more and more manufacturers offering cheaper and cheaper tablet solutions, you are truly in the midst of a sea of choices; how will you ensure you don't drown? We've got it covered. Not only will we try and help you figure out whether you need a tablet or whether a smartphone will suffice, and we'll also give you a detailed rundown on the various hardware specs, software platforms, and most importantly, the apps available on various tablet platforms. Thus, choosing the right one for your job should be a breeze.

We'll also peek into the future, to see what the future holds, and examine some emerging technologies such as integrated projectors, flexible touchscreens and augmented reality.

We hope you enjoy this Fast Track, and remember to write in to editor@thinkdigit.com and tell us what other topics you'd like us to cover. 



THE QUEST FOR PORTABILITY

Evolution of mobile computing

Computers, when they started out, were huge monsters that occupied entire rooms and consumed massive amounts of power. Debugging an error required you to be a skilled engineer, and access to computers was restricted to very few. The invention of transistors, specifically CMOS technology changed all of that and heralded a pace of innovation never seen before. As mainframes evolved into desktop PCs, their usage grew, and soon the need for portable computers arose.

The earliest laptops were bulky devices, usually running a watered down version of a desktop OS as their hardware didn't support all the functions of a traditional OS. The Toshiba T1000 released in 1987 and considered one of the

best laptops of its time, used a 4.7MHz Intel processor and 512KB of RAM and ran MS-DOS. (The display was a two-color dot-matrix display). As technology progressed, power efficient chips were developed (particularly the Intel Centrino series of chips) and were instrumental in popularizing the use of laptop computers. Apart from superior power management, they also standardized wireless adapters that enabled them to connect to wireless networks on the go, thus turning laptops into a complete replacement for traditional desktops, with the added advantage of mobility.

The precursor to today's smartphones, PDAs or Personal Digital Assistants were very popular, especially with business users who needed an ultra portable computer without compromising on the essential features. PDAs function as Personal Information Managers (PIMs), meaning they combine the functions of a planner, organizer and a phone into one device, often with internet connectivity via data networks or Wi-Fi for tasks like sending and receiving emails or browsing the web. Larger screens with touchscreen input or a full QWERTY keypad were synonymous with PDAs. Devices running on Palm or Windows Mobile typically used touch screens with handwriting recognition and a stylus for data input, while Blackberry popularized the physical QWERTY keypad. Some of the higher end products came with built in GPS radios for navigation capabilities and SD cards for storing digital media such as music and video files. Most had the ability to sync with a desktop computer, so data could be easily shared between the two devices. Though syncing with the cloud was still absent, syncing with one's PC had three valuable advantages. One was that the user data was automatically copied to both devices, eliminating the need for manually entering the data twice. Second, that in case one's PDA was lost or stolen, the data could be restored by simply re-syncing it with the desktop. Since data entry was slightly uncomfortable due to the cramped (virtual or physical)



Apple's MessagePad was far ahead of its time

keyboard on a PDA, one could enter the data using a standard keyboard on a computer and sync it to the device.

A novel device that gained popularity in the 90s but faded away soon after was the Digital Diary. At its core, a digital diary was a digital assistant to your daily life, allowing you to store a variety of information and retrieve it later. They were capable of storing calendar entries, text and voice memos, todo lists and included productivity software such as an address book, calculator, world time and alarm. Since all of these functions began to get integrated with phones and PDAs in the coming years, people lost interest in these standalone devices that lacked connectivity features.

The first tablet computers

Though the tablet market has received enormous attention and hype in the recent years, the concept of a tablet dates back to more than 20 years, when the first handheld slate-like devices were introduced. Interestingly, it was neither Microsoft nor Apple who spearheaded the innovation in this segment. As with most technology, there was a significant time lag between the conceptualisation and realisation of the product. The earliest concept of a tablet computer goes way back to 1960s, where Alan Kay envisioned a device called the 'DynaBook' that would function as a 'personal computer for all ages'. The device would use an LCD technology (revolutionary for the time) and a physical keyboard at the bottom. The concept had several features that would come to be implemented only decades later, such as the ability to connect to wireless networks, playback audio files and voice memos. It was intended to be a learning aid for children, and while it was never realised in practice, the idea served as a starting point for the future of handheld computing. Some of the notable ancestors to today's tablets are listed below:

1. The GRiDpad – GRiD Systems

The first true tablet device was the GRiDpad, developed by GRiD Systems. The device boasted very impressive hardware specs for its time, including a 20MHz processor, 2MB of RAM, up to 120MB of storage, a 10" backlit VGA display and 3 hours of battery backup. Although the GRiDpad ran MS-DOS, it had some customizations built atop it to take advantage of the stylus input system. Jeff Hawkins even created a language called GRiDTask to quickly create and install simple applications for the device. He would later go on to leave the company and start his own company, Palm, which was responsible for a string of highly successful mobile devices.

2. PenPoint and the Windows XP Tablet Edition

The next significant entrant into the tablet market was GO Computing. GO built an operating system called PenPoint, which was built from ground up to take advantage of the pen-based input system. They also added an add-on for Windows 3.x called Windows for Pen Computing and tablet users could dual boot between GO's own OS or Windows 3.x. Pen Windows was licensed by Microsoft and eventually evolved into Windows XP Tablet Edition.

The Windows XP Tablet Edition PCs used an advanced handwriting recognition software that only got better with time. It used a machine learning algorithm to actually “learn” your style of writing, and store the text without converting it. All the text written by the user could be searched, edited and annotated like one would normally do on paper, without the need for any form of conversion. The platform looked solid on paper, and a number of ‘hybrid’ devices arrived – essentially laptops with screens that could accept pen-based inputs and would swivel around to reveal a tablet.

3. Apple's Newton platform

Not to be left behind, Apple debuted the Apple Newton platform with the MessagePad line of devices, a PDA (Personal Digital Assistant) that was far ahead of its time. The Newton shed many of the traditional desktop paradigms that one was used to, such as manually saving files or a hierarchical file system. It was marketed towards professionals who would be required to sketch or quickly take notes, such as architects, designers and doctors. The device had a screen that was sensitive to stylus input, and was complemented by a slew of productivity applications including a notes, calendar and contacts application. Later versions came with a Calculator, unit converter, word processor and a spreadsheet application. Apple enabled the device to import or export files between equivalent desktop applications using the PIM (Personal Information Manager) format. Data was stored in databases called ‘soups’, and these soups could be shared between applications, so the calendar application could



Apple's MessagePad was far ahead of its time

access data from the user's contacts to set up an appointment or even from the notes application.

Earlier versions of the OS fared poorly with regards to handwriting recognition, specifically cursive handwriting. This remained one of Newton's drawbacks, and many remarked that the absence of this feature alone could have helped the MessagePad become a greater success. Future iterations of the device improved upon handwriting considerably, and it could identify text written in block letters (a system called 'Rosetta') very well. Indeed, this technology remained unrivalled upto 10 years after production ended. Several other gesture-based interactions such as the ability to 'strike-out' a wrongly entered word or to encircle a word to 'highlight' it were built in, and the OS sported 'in-situ' word correction, where a user simply had to double tap a wrongly interpreted word and a list of alternatives would pop down, letting the user choose the correct one. Text could also be entered via a virtual keyboard that would pop up when required. So strong was the support for pen-based gestures, that the MessagePad would identify when the user was trying to draw a shape such as a line, circle or a polygon, and would correct the shape into an exact vector figure. These 'Shapes' would automatically be assigned specific vector points (such as vertices for a polygon) which could be changed manually. Also supported was 'Ink Text' which was a form of searchable free-hand text. Additional formatting options like word-wrapping and bold, italics and underline were also supported for 'Ink Text'. Thus a note saved using the Notes application could have any combination of free-hand sketches, shapes, handwritten text or printed text entered via the virtual keyboard.

In terms of connectivity, Apple included highly advanced features such as Infrared radios and support for native modem and ethernet connectivity thanks to the included PC Card slot. Developers from the Newton community also wrote drivers for the IEEE 802.11 and Bluetooth protocols. By the use of peripheral adapters, auxiliary tasks such as printing and sending faxes was also made possible.

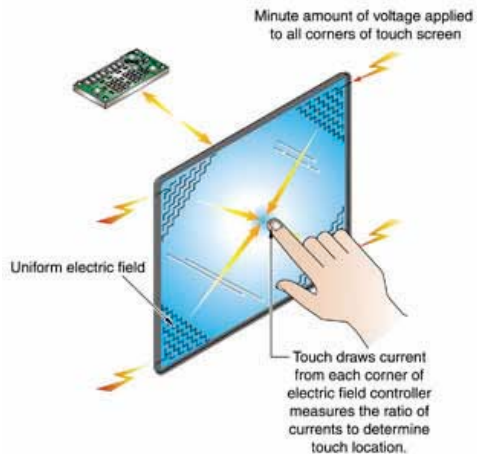
Inspite of having features so far ahead of its time, the MessagePads failed to generate the kind of hysteria generally associated with Apple devices today. From a technical perspective, the Newton had a memory fragmentation issue which required users to reset the device every few months or so. The most frequently used application on the device, the notes application was notorious for being a memory hog. The device dimensions were uncomfortably large; for it could neither be operated with one hand (like a modern day cell-phone) nor could it be carried around in one's pocket, greatly reducing its mobility. The syncing features on the Newton were spotty at best, and the MessagePad soon turned

into an island of a device. They were priced very high, around \$800 which was a very steep price for its feature set, particularly at the time. Lastly, after Steve Jobs returned to Apple, he showed no interest in continuing development on the Newton platform, and development officially ended in 1993.

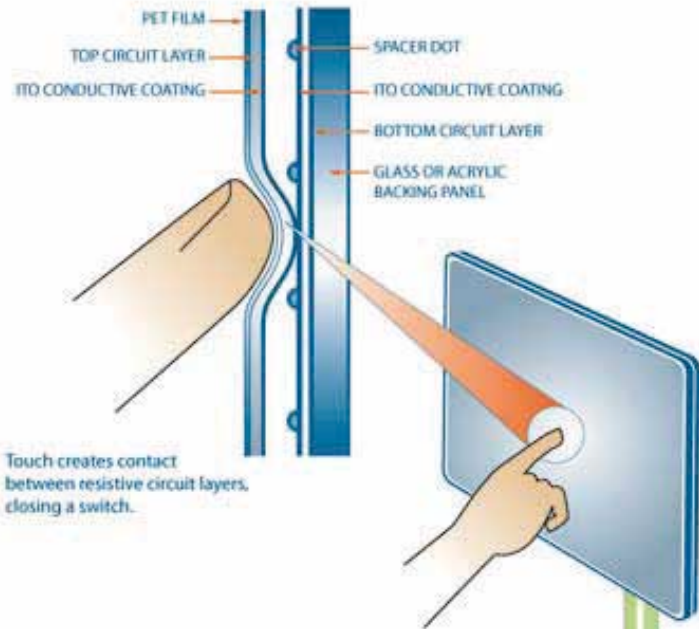
Methods of data entry

The tablets and mobile devices such as PDAs and smartphones use many different technologies to implement their core function – data entry. While some use a resistive touch screen along with a stylus for handwriting or virtual keyboards, others choose to use purely capacitive touch screens that require the use of one's fingers only. Still others come with full physical keyboards for quick data entry.

Early tablets such as the PenPoint display and the Apple Newton used a 'resistive touchscreen' which consisted of two thin conducting sheets separated by a distance. When a point on the screen was pressed down, the pressure would cause these two thin sheets to deform and come in contact, thereby completing an electric circuit. This would then act as a voltage divider, and the voltage sensed at the other end of the screen would help in determining the exact location of the touch. Since the touch relies purely on pressure, the technology is device agnostic, i.e. It doesn't matter whether you use a stylus or your fingers to interact with it. Styluses were popular due to their ability to precisely pinpoint a location as well as aid in handwriting. However, the styluses were an auxiliary component that had to be carried around with the phone everywhere, and were liable to be misplaced or forgotten, in which case the user would be in trouble. The technology of resistive touchscreens itself had many inherent flaws. A significant portion of the light emitted by the display was absorbed by the screen itself, resulting in lower brightness of the display. Since the display only registered a change in pressure on the screen,



The principle behind the working of a capacitive touchscreen



The principle behind the working of a capacitive touchscreen


it could only detect one touch at a time, eliminating the possibility of a multi-touch display. Resistive touchscreens were less responsible in general.

Most modern touchscreen devices employ a technology called ‘Capacitive Touch’ which rectified many of the shortcomings of stylus-based resistive touchscreens. Steve Jobs famously remarked, “Who needs a stylus? God gave us 10 styluses—let’s not invent another” and vehemently refused to include a stylus of any kind in his iconic products – the iPhone and the iPad. As the name suggests, capacitive touchscreens use the principle of a capacitor to register interactions with the device. A thin layer of conducting material rests below an insulating glass piece. The conducting layer carries a current of constant magnitude and frequency. When another conducting, current carrying device (such as the human finger, which carries a small amount of current) comes in contact with the screen, it creates a change in the current in the circuit due to charge build up near the finger. This change in current is registered by the device, which helps in tracking the exact location of the touch. Capacitive touch screens have several advantages over their resistive counterparts. They are longer lasting, more



Toshiba's Portege 3500 was a laptop-tablet hybrid, running the Windows XP Tablet Edition

scratch-resistant and dustproof. The technology allows the device to register multiple interactions, giving rise to multi-touch devices like the Apple iPhone. In addition, capacitive screens emit a greater portion of the light, thereby providing a greater amount brightness.

It is interesting to note that there exist styluses for capacitive touch screens as well, providing greater accuracy for tasks such as sketching, drawing or quickly jotting down notes. Since capacitive screens allow for multi-touch, we have the ability to use both a pen and our fingers simultaneously. This was demoed by Jefferson Han in his project titled, 'Perceptive Pixel' where a large 82" touchscreen used a combination of simultaneous finger gestures and pen-based annotations to emulate a real life working scenario. Styluses provide an interesting accessory to touchscreens, but due to the above mentioned drawbacks, are unable to completely replace the natural, gesture-based interactions using fingers that today's devices currently use. 



APPLE AND THE TOUCH INTERFACE

Now, no one is calling Apple the inventors of the touch screen, but if you glance over their patent for this technology closely, it would appear that they almost own all rights to its applications and use in devices. With US patent number 7966578 (<http://google/2bb8V>), Apple has been awarded control over “[a] computer-implemented method, for use in conjunction with a portable multifunction device with a touch screen display, [that] comprises displaying a portion of page content, including a frame displaying a portion of frame content and also including other content of the page, on the touch screen display”. So basically, the

interface you use to navigate around a capacitive touch screen through multi-touch gestures is under Apple's ownership. Understandably, with manufacturers adopting this technology to more and more communication and entertainment devices, Apple has time and again needed to settle patent disputes in courts.

So, how did Apple's journey of taking over people's imagination and their phoning habits, start? For quite some time now, engineers and scientists have been working on making handheld devices even more personal and by the 1990s the cool new thing was the touch interface. Hewlett



Newton PDA, which laid the foundation for all future Apple touch screen devices, meets the iPhone; image: Wikipedia

Packard had already introduced the HP-150, a home computer with a touch screen which detected finger movements and soon people were adapting the technology onto smaller and smaller devices. The nineties introduced the now so common smart phones, with Apple releasing its initial entry into this market – the Newton PDA. It

was a personal digital assistant with handwriting recognition and their first tablet platform – the predecessor of iOS used in the iPhone, iPod Touch and iPad. It was followed closely by IBM introducing their own smart phone – Simon, which boasted a calendar, note pad and even fax along with a touch screen to dial numbers. In 1996, Palm dominated the PDA market with its Pilot series and 2002 had Microsoft foray into this segment with the Windows XP tablet edition starting their own touch screen ventures. But none of these attempts quite compare to the craze and charisma of the evergreen, everlasting Apple iPhone (and eventually the iPad).

Almost half a decade ago in 2007, Steve Jobs showcased the king of all next generation smart phones – sleek, user friendly and working entirely on the touch technology. Was it the design or the user-interface or the

apps that made it fun for everyone? You couldn't quite say with certainty, but Apple had cast a spell. The smartphone industry or even human-computer interaction on a broader scale, was never the same again. In its characteristic way of subtle and oblique publicity, Apple aired the first advertisement for iPhone during the Academy Awards that year, with a series of images of actors saying hello into telephone receivers and ending with a shot of iPhone and the subtext "Hello. Coming in June". The ad was efficient and straight forward, just like the product, which went on to be named Invention of the Year by Time Magazine. Priced initially at \$599 for the 8GB version and \$499 for the 4GB model, sales took off immediately. In fact, the demand was so high that AP reported in 2007 that some users were unable to activate their phones because as per AT&T, the fixed service provider, "high volume of activation requests was taxing the company's computer servers". These prices were soon slashed down, by as much as a third, and the demand kept increasing.

So what made the iPhone click, and how did it revolutionize people and their interaction with personal gadgets forever? Firstly, the technology might not have been exceptionally original but the packaging definitely was. Apart from Steve Jobs, British industrial designer Jonathan Ive, is to be credited for most of the design appeal, for which he received praises all around the world, eventually earning him honorary doctorates from premier schools like RISD and Royal College of Art and the ultimate Briton honor, a knighthood in 2012. What started as translucent, multi-colored iMacs, under Ive made way for the minimalistic consumer design of the iPhone and popularized some key aesthetic traits like a single home button on the entire product apart from the screen. As per the standards of those days, it was almost an anorexic device clocking in at only 11.6 mm width, and despite the touch interface, to its amazing portability delighted the public. And while people were still getting used to their touch phone, came Apple's next offering – the iPod Touch. Apple had thus laid the groundwork for its touch screen gadgets combo of iPhone, iPod and the soon to come iPad.

The iPhone touched the million units mark within months of its launch, and by 2012 with four different models till date – the original iPhone, iPhone 3G, iPhone 3GS and iPhone 4 – the collective sales are soon expected to touch 200 million. The figures in themselves cannot be contributed to a single factor as such, but apart from the aesthetic design, the other most appealing factor was the large world of apps it opened up. This remained

no longer a telephone – a device to make and receive calls or short messages; it was much, much more than that. Everything was just a finger touch away, email on the move, maps with more clarity and usability, and much more. Be it the weather or the stock market, there were applications covering everything made especially for your iPhone. And now it even comes with the Siri voice interface!

Also, the iPhone's touch interface came naturally to people, and this proved to be another big draw for a user. You could use your finger to 'flip' through to the next page much like in a physical note book, you



Apple iPhone brought an iconic touch interface that did not need a stylus

could turn the phone on its side and the image would automatically switch between landscape or portrait, with just a flick of the finger you could scroll up and down a page, typing in required only light touches on a virtual keyboard, and zooming in and out was as simple as holding onto a picture and gently moving two fingers closer or taking them apart. These features and gestures, some of which came intuitively and others that could be learnt quickly laid the foundation of how people would work on most future touch screen devices. And the popularity of the iPhone

left no doubt to the other entrants into the touch screen arena that Apple had developed an interface universally understood and liked, which put people at ease with their instrument. Most followed into its footsteps with minor changes here and there but stuck to the basic layouts and gesture recognition as the iPhone and this same user interface passed onto almost all tablets we use today. This compact, feature-packed gadget, to date, remains a milestone for this technology. Its popularity is a testament to what a user wanted from a phone.

Once it set the standards in the mobile industry, Apple concentrated elsewhere, and gave the world its very first iPad in 2010. Most people argue this wasn't revolutionary technology in itself, as various versions of the tablet had been in use for a long time by then. The critics were silenced when Jobs in his characteristic style showed the world that till you actually haven't used a particular product, you wouldn't even know you needed it. Its first week saw long lines of eager early adopters flocking to Apple showrooms leading to short-term supply shortage. One of the biggest leaps Apple took was that unlike other manufacturers, iPad had done away with the use of a pressure triggered stylus, instead making the full multi touch screen workable with your fingers and with the virtual keyboard popping up wherever needed meant that a physical one could be dumped making the design more compact and portable.

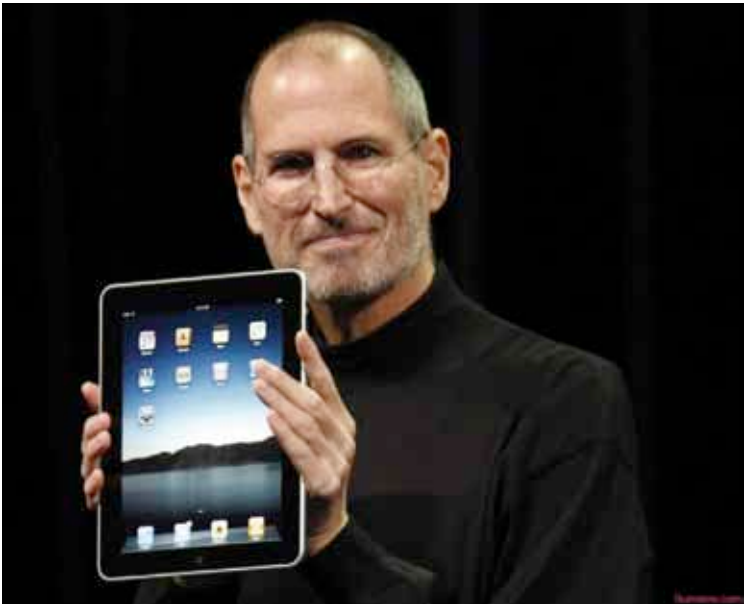
On its first day itself the iPad sold 300,000 units and touched 3 million in 80 days. By April 2012 as per Apple's quarterly reports, almost 67 million units had been sold and with the latest model – the third generation iPad just hitting the market, sales are predicted to go higher than ever. So what was it that attracted people to Apple's newest offering? A combination of numerous factors working in its favor it would seem. It had the looks and the style to begin with, it had the perfect size to read documents,



Gesture recognition in the iPhone

watch videos or to browse web pages while managing to not be as bulky as your laptop. It worked on the iOS operating system just like all other Apple devices and had similar features- the touch recognition was the same, people could use it with ease and this became the perfect platform for audio visual media like books, movies, music, games or web content.

This big touch screen gave developers full freedom to experiment and innovate, and more and more unique programs keep coming up for the iPad with its apps market opening up with even more gusto. The iPad comes with several applications including Safari, Mail, Photos, Video,



Steve Jobs introducing the iPad

YouTube, iPod, iTunes, App Store, iBooks, Maps, Notes, Calendars and Contacts, many of them improved versions of those developed for the iPhone or Mac. Though not designed to replace your mobile phone, a VoIP application even allows users to make calls using a wired head set or built-in speaker and microphone over Wi-Fi or 3G. You could play more interactive games, use features like maps with even more details and fluidity, browse e-books at par with dedicated readers like the Kindle, and do lots more cool things with the multi finger gesture support such

as four finger swipe to toggle apps or five finger pinch to close apps. The iPad shook up the world of casual computing with its clever design and almost intuitive ease of use.

Striving for perfection, Apple brought out the iPad 2 and now the third generation iPad. A camera was missing in the original gadget and was included on the front and rear in its next models. The third generation model looked almost exactly like the iPad 2 retaining the same glass and aluminum construction and same dimensions, the same home button and volume rocker on the right side, but as soon as you switch on the screen, the magic begins. Apple reset the standards of display when it introduced the Retina display in its iPhone 4, and the new iPad brings the same experience onto your tablet screen as well. The model's 2048-by-1536 pixel, 9.7-inch display successfully sets another standard for all coming tablets to match. The text is crisp, images are sharp and quality videos can be seen just the way they were meant to, all that's missing are newer, improved apps to catch upto the amazing display. Apple even partially included Siri in its latest iPad edition.

But the biggest thing the iPad can be credited for is heralding an era where people carry smart phones, have tiny music players in their pockets, work on their laptops and desktops as much as before, and yet somehow find use for a device combining all the above. When many critics shouted their doubts out loud as to who would buy the iPad when you already have an iPhone and an iPod around, Apple just went ahead and gave us another smart product that harmoniously blended into our digital lives and opened up the gates to many more manufacturers hoping to recreate if not replace the same experience. Tablets made users more accommodating in a way that tablets started finding permanent places outside a geek's desk. There are now classrooms which teach students on iPads instead of pen and paper, musicians are making melodies while on the move, writers and authors alike are enjoying the freedom of ditching bulky volumes and adopting digital book shelves; from cooking recipes to beauty tips, everything is out there for us on this one tiny tablet, no wonder the trend is catching on. The popularity of iPhone and iPad has once and for all answered the question that the touch screen is not just a passing fad, but a digital trend that is here to stay.

The UI might be Apple's forte, but with open source Android looming large, would being a closed system prove to be its Achilles heels? Apple so far successfully controls the entire ecosystem of its products, the software,

hardware, content and services, from inception to production everything is within the Apple family. This was believed to be the key to Apple ensuring high- quality products that are reliable, easy to use and aesthetically appealing. Let's take for instance Apple's very own iTunes Store. By using iTunes and with an iPod we can take our digital content with us or save it on our computer. But at the same time it restricts our ability to share music by locking down easy music transfer onto someone else's iPod. Apple, through the iPod-iTunes service, gives the music industry greater control on how people use music. And the situation's the same



Apple's pioneering contribution in the touch-revolution: iPod, iPhone, iPad

with iPhone and iPad. Every single such product application is vetted through Apple which controls and monitors all resources. This same closed strategy in the past had prevented Apple from dominating markets against more open platforms like Windows from Microsoft Inc. during the PC turf wars in the late 1980s.

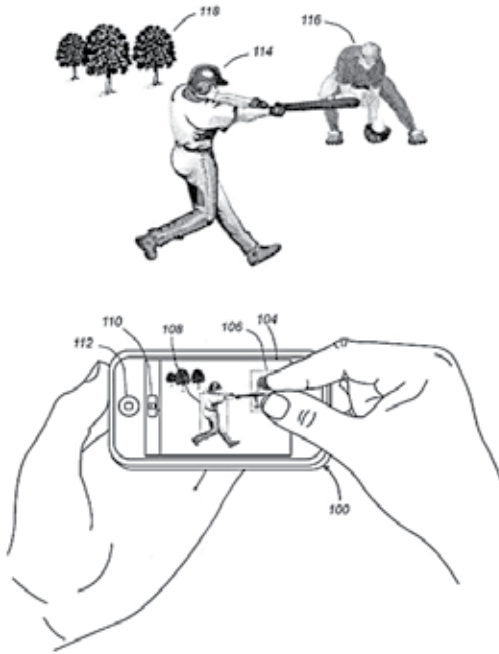
History may not always repeat itself, but too many restrictions placed on them may occasionally draw ire from the developers' communities forcing them to gravitate towards Android and other operating systems where they have full freedom to explore and exploit features. Adobe System's Flash not working on Apple products even today leaves a chunk of web content unviewable on your iPhone or iPad, and when such cases arise, the heavier champion will win. Either web sites will slowly let

Flash die down and look for other standards like HTML5, or Apple will have to bend and be more accommodating. So far, Apple shows no sign of softening and how the company grows and its product sales magnify will depend on such decisions. This was one of Steve Jobs' key principles, but with a fresh management taking decisions and new brains guiding it, Apple is now evolving faster in many ways, and to keep its control over the tablet market with the hit iPad, it may just have to question old policies and take more risks.




No Flash support means Apple has to provide a built-in YouTube app to browse and view videos from the popular site

Now, just as with all other new technology, the iPad also sparked a debate over what it meant for modern lifestyles and its impact on society as a whole. Would a tablet remove our reliance on the many other gadgets around us, would it mean the extinction of books, mp3 players or even computers on the longer run? And if that were true, would it mean we are living a more sustainable digital life? The questions are many and the debates are endless. And all is speculation as of now. The fact is iPads and tablets have started invading our lives for only the past couple of



Pictures of a multi-touch focus camera in Apple's latest patent awarded in May, 2012

years, and whether they eliminate the junkyard of electronics around us is a question only time will tell, till then we can simply curl up with the mug of coffee and lay back to play *Angry Birds*. What's Apple upto in the meantime? With their latest patent on touch interfaces, rumor mills are running wild with speculations of a touch iMac being unveiled sometime soon, and another patent allows users to touch and select two or more areas through your camera's view to focus on. Leave it to them to show you what all is possible through a simple touch, Apple truly has played the biggest role in making this interface as popular and usable as it is today. 



THE EMERGENCE OF GOOGLE ANDROID

The most direct rival to Apple's iOS software is the ubiquitous Android platform, backed by Google and adopted by several prominent device manufacturers over the world. Android gained favour as a viable alternative to iOS and quickly established itself as the quickest growing and most widely used smartphone platform. Its popularity can be credited to its openness, which ensured a developer-friendly environment and a vibrant app-ecosystem, and enabled handset manufacturers to port Android onto a wide range of devices resulting in a

large user base. Consumers were now presented with a plethora of options in terms of form factors, screen sizes and hardware features while developers had unprecedented control over their apps and a large target audience to monetize their work.

Android's meteoric rise to power in the mobile space, however, was met with criticism from experts who complained about Android fragmentation, greater susceptibility to malware infections and app piracy—all offshoots of the open nature of the platform.

History

Android.inc, a startup specializing in software development for mobile devices, was acquired by Google in 2005. Many interpreted this as a sign that Google was coming out with its own phone, the gPhone, to promote its ad business on mobile devices. However, Google denied such claims and co-founder of Android Inc. (and later head of Android Development at Google) Andy Rubin stated that it was aiming at a software development platform that would enable hundreds of devices to run Android and create a user experience that was unheard of. This was followed by the formation of the Open Handset Alliance (OHA) in 2007, which was a consortium of several companies led by Google that pledged the formation and promotion of an open software platform for mobile devices. The OHA included handset manufacturers, semiconductor companies, software companies and mobile carriers in addition to Google itself, all of whom believed in an open mobile ecosystem that would foster rapid innovation, ultimately benefitting all the parties involved and delivering a superior mobile user experience to end users. Prominent companies such as HTC, Intel, Qualcomm, Broadcom, Samsung, Motorola, Nvidia, T-Mobile and Sprint Nextel, among others, were part of the initiative. Presently the OHA has a total of 84 members with Android being the first of many projects towards the goal of providing open standards for mobile applications.

According to the OHA, Android was “built from the ground-up to enable developers to create compelling mobile applications that take full advantage of all a handset has to offer. It was built to be truly open”. Based on the open source and vastly popular Linux kernel, Android allowed developers to easily create and deploy apps, using the Android SDK. The SDK was released by Google as part of the Android Open Source Project (AOSP), which also aims to maintain compatibility between different devices running the Android Operating System.

As a result of the efforts of the OHA, the first Android phone was released in 2008. Called the HTC Dream and popularly known as the G1, the device marked HTC's foray into the Android segment. Several other manufacturers would follow suit, resulting in the market getting flooded with a wide variety of mobile devices, all running Google's Android platform.

What is Android?

Put simply, Android is the sum total of all the software that allows a device to function as a phone.

At the lowest level of abstraction reside the various hardware components like the internal circuitry, the sensors and various radios like the GSM telephony that handles the device's phone operation, and the Wi-Fi,



GPS and Bluetooth radios. On top of this layer is the operating system's kernel. Android uses the free and open source Linux kernel, (originally modelled after the mainline kernel, version 2.6) with some tweaks with regards to power management. These tweaks were submitted back to the mainline kernel, but were rejected due to Google's lack of interest in maintaining them. Moreover, the kernel has been modified to make it compatible with the ARM architecture, known

for its energy efficiency. The next layer consists of three parallel (from an abstraction point of view) components –

1. The libraries written in C that perform various data processing functions, such as SQL lite for managing structured databases, The Open GL ES library for 3D graphics and the Webkit engine for rendering web pages.
2. The core libraries written for Android as well as the Java libraries that deal with the various Java APIs used while writing Android applications
3. Dalvik Virtual Machine, that manages the memory used by various applications and assigns a separate process to each application, so that should an application crash, it won't bring the whole system down with it. Above the DVM resides the Application Framework Layer

The Application framework layer is the highest level of abstraction, containing many higher level libraries such as those used in telephony, data resources and the user interface. All Android applications are built on the Application framework layer. The Android system allows the reuse of code components, thus easing the developers quite a bit of hassle in sharing resources such as data and services between applications.



The Google Play Store formed a bridge between developers and consumers

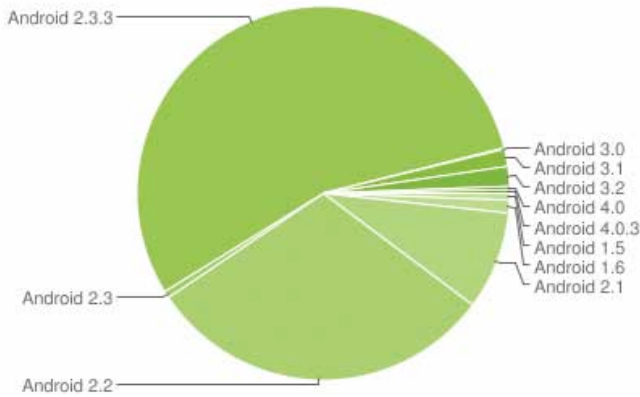
Android versions are code named alphabetically, and are traditionally named after desserts, starting with version 1.5 called Cupcake, right up to the current version of Android 4.0, code-named Ice Cream Sandwich. The next iteration of Android, version 5.0 has been named Jelly Bean, and is slated for release later this year.

The Android ecosystem

Right from the onset, Google was very particular about not just creating a Google-branded phone, but of creating an entire ecosystem that would leverage Google's services and create a platform for development of applica-



Various levels of abstraction within the Android OS



The chart shows fragmentation in Android versions as of January 2012

tions. In keeping with this spirit, Google launched the Android SDK that gave developers access to the length and breadth of Android's APIs, and programmers could access device functions such as the telephony, camera, data from the GPS device and the various sensors to create rich applications that deliver a phenomenal experience to users. This freedom spawned a range of apps such as games that would respond to changes in orientation and mapping and navigation applications that would use GPS data to pinpoint your location, and even map out the night sky for you using the phone's camera.

The Open Handset Alliance had declared that all applications within an Android system would be given equal status, as opposed to granting higher privileges to system applications like the phone or messaging. This allowed software developers to create apps that could rival the default system apps provided by the handset makers. For instance, a developer could write a third-party photo-viewing app, and a user would be given the choice of opening a photo in the default system app or the third-party one.

Google started the Android Market (rechristened the Google Play Store in 2012) to provide a one-stop venue for all app downloads. Similar to the Apple's App store for iOS devices, app developers would publish apps to the Play Store where they would be available for download. They could choose to charge a fee for downloading the apps, a portion of which would be pocketed by Google. The market gave Android a huge boost and expanded its user base, for consumers finally had a decent alternative to the iOS platform, with competent hardware, a developer-friendly OS and a rapidly growing repository of Android apps.

In March 2012, Google rebranded the Android Market as the Google Play Store, and expanded its offering from providing just Android apps to a library of digital media content, including books, movies and music, merging its Google Music brand under the Google Play Store as well.

Openness of the Android platform

The openness of Android is one of its most important strongpoints. Giving away the source code for free opens up nearly limitless potential for customization and hacking, and the strong and ever growing community behind Android has done just that. One of the best examples of this are the aftermarket firmware or Custom ROMs available for many popular Android devices. While a ROM traditionally refers to ‘Read Only Memory’, the Android community changed it to mean a modified image of the operating system that can be installed (or flashed) on a phone to increase its capabilities. ROMs can be engineered to fix bugs with the original firmware, make devices faster and more capable or to provide more frequent and timely updates to higher versions of Android. Many custom ROMs such as the popular, community supported Cyanogenmod aim to introduce newer features onto older and outdated devices, while others such as MIUI try to improve the aesthetic appeal of the Android experience. The ‘stock’ ROM or the OS that the device ships with may contain unnecessary and bloated applications or undesirable modifications to the Android system forced by the OEM (collectively called crapware or bloatware). Custom ROMs can help in getting rid of such nuisances and deliver a pure Google experience, unhindered by the manufacturers attempt to ‘differentiate’ the device from others in the market.

Another popular technique is to ‘root’ the device, which is Android speak for gaining administrative access to a system’s protected files. Rooting is a popular procedure carried out by many users to extend the capabilities of the device and enable one to take full advantage of the hardware and the software on an Android phone. Once rooted, users are able to use apps that can overclock or underclock a phone’s CPU, use the phone as a wireless hotspot, backup the system securely or remove bloatware. Android’s strong community support ensures that even those users who aren’t technically inclined are able to take advantage of their devices.

While Android’s strength lies in its massive community and developer base thanks to its openness, this is ironically its biggest weakness. The open nature of the platform requires users to be able to install third-party applications easily, but this feature has also contributed to piracy among Android

apps. Since extracting the .apk file (the file with which one installs an app) is a trivial affair, many paid apps can be obtained for free with virtually no effort. This obviously acts as a deterrent to developers who see much smaller earnings from their Android apps than their iOS counterparts. Market research companies have also noted that Android users are far less willing to pay for apps than iPhone users, and developers are forced to release free but ad-supported versions of apps.

Possibly the biggest gripe with the Android platform is that the market is too 'fragmented'. Fragmentation can be due to the near infinite variety of devices, each differing in screen size and hardware specs, or in terms of the version of Android they're running. This limits app compatibility for developers, and there is no guarantee that an app published to the Google Play Store will work on every single Android device out there. Many may face compatibility issues due to inferior hardware or smaller or lower resolution screens. OEMs and carriers who wish to differentiate their products from the vast expanse of Android handsets try to skin the OS with a custom interface such as HTC's Sense or Samsung's TouchWiz. While these skins add additional functionality to the OS, updating these skins when a new version of Android is released can take a significant amount of time and many users are left using an outdated version of the OS.

Another cause for fragmentation has been offshoots from the original Android project such as the Amazon Kindle Fire and the Barnes and Noble Nook, both runaway successes, which only serve to worsen this condition. Both use a highly customized version of Android with their own app store for downloading modified versions of Android apps, and are incompatible with the original Google Play Store. The Amazon Kindle Fire has been a runaway success with a greater share of the tablet market than conventional Android tablets, and hasn't shown any signs of slowing down. Such products require developers to submit apps to multiple online stores, often with different rules and revenue schemes. It's also the one factor where Apple has a clear advantage, for Apple exercises complete control over the hardware and software that goes into its products, along with strict regulation for apps that enter their App Store.

In reply to this criticism, several developers have stated that Android fragmentation is not an issue, but a feature of the ecosystem, and a very important one at that. The issue of screen sizes can be tackled fairly easily as the Android SDK allows programmers to provide different graphics for different resolutions, with an emulator that can emulate nearly any

device out there. It allows the phone to override certain layouts when screen space is constrained and even provides libraries to provide backward compatibility for older versions of Android. The sheer diversity of devices available in the market ensures that any person looking for a phone can find one to meet his exact requirements, whether it's for a power user looking for the most powerful hardware to hack into or the average user who wants to use it as a bare-bones communication device. Indeed, Android has even been ported to devices such as portable media players, cameras and even a coffee-vending machine! All this portability is possible only because of the open source nature of the platform.



The Kindle Fire, running Amazon's custom skin atop Android was an instant success

A level-playing field

Android has succeeded in creating a level-playing field for hardware vendors and handset manufacturers by letting them focus on what they do best—the hardware of the device. This approach has proven to work very well with many manufacturers, particularly Samsung, HTC and Motorola. While Samsung is currently ruling the roost thanks its Galaxy range of smartphones, the wildly successful Motorola Droid was instrumental in reviving the fortunes of the ailing company. Today Android occupies a larger market share than Apple's iOS in the US, and Samsung is the world's largest smartphone manufacturer. The ultimate winner is the end-user who is faced with nearly endless options while buying a phone.


Android on Tablets

Android tablets experienced a very different fate from Android phones. The lack of dedicated apps that could take advantage of the tablet's larger display meant that most apps looked stretched on a tablet. Developers failed to recognize the potential of the tablet market and didn't start paying attention to tablet-specific apps until much later, when the iPad had gained a significant

fan following. To remedy this, Google launched Android 3.0, christened 'Honeycomb' specifically for tablets. However, the product was an unfinished one during launch which resulted in a number of software glitches and prevented Google from releasing the source code to Android 3.0. One more reason why Android tablets didn't go down too well with consumers is because of the price. Most of the early tablets like the Motorola Xoom were significantly pricier than the iPad (\$800 for the Xoom versus \$499 for the iPad 2). To make matters worse, users complained of malfunctioning hardware like GPS and Wi-Fi issues. Only after the launch of Android 4.0 which brought a unified experience on tablets as well as smartphones, did the Android tablet market start to gain traction. Manufacturers such as Asus and Samsung launched tablets with competent hardware to support Ice Cream Sandwich which prompted developers to release tablet-optimized versions of their apps.

No mention of Android tablets is complete without a reference to the Amazon Kindle Fire. Though based on an older version of Android (Gingerbread, version 2.3) Amazon gave the Kindle Fire a completely new skin and built an ecosystem around it, comprising the Amazon App Store for downloading Kindle-specific versions of apps and leveraging their massive collection of digital content, including ebooks, music and movies. The most important feature of the Kindle Fire though, the one that was responsible for its astounding success, was its price. Priced very competitively at \$199, it sold for less than half the price of the iPad and promised consumers easy access to a world of digital media. Other providers like Barnes and Noble adopted a similar approach with the Nook.

Android in India

Android phones have gained widespread acceptance in India, as they appeal to both the budget conscious as well as those looking for a high-end device. Consumers have started looking beyond feature phones and the vast internet-using population provides a ready market for Android devices. Indian companies like Micromax and Karbonn have introduced low cost Android tablets powered by Android 4.0 (Ice Cream Sandwich) and have created a niche segment for themselves. Reliance Infocomm has entered into an agreement with Google which gives it exclusive rights to market the Android brand in India, along with a 3G data plan of 1GB of free data for a month. 



WINDOWS AND OTHERS

Never count Microsoft out of the game: Microsoft isn't extinct yet! Though, in statistics after statistics, you rarely see Microsoft included, in the mobile OS market. Simply, they are not doing well and not firing in all cylinders. Alas, we all tend to forget that Microsoft owns Windows and is the king of office tools, with Office.

Apple and Google have proven to be far nimbler in the past decade, out-maneuvring and out-innovating the competitors. Apple and Google already have a large foothold in this space.

What if Microsoft makes Office free on all its Windows Mobile devices? That means you don't have to buy Office separately when you buy a Windows Mobile powered tablet. Even the licensing can be waived. Think about Windows CE and its low fees. Microsoft just bought Skype thereby opening a new phase of mobile communication. Do you know the impact of people making calls for free? What happens to the telecoms?

We think Microsoft must market its mobile business more aggressively and make it more exciting. Microsoft has more opportunities, so it can't be underestimated. It can even knock out BlackBerry and push harder to lead the business sector where it always does well, if it offered Office bundled in tabs. Microsoft hasn't really been good in the consumer market, Apple rules there. But with Skype and good marketing, that can change. One can't really count Microsoft out of the race. Not yet. As tablets and smartphones eat into the PC market share, Microsoft's revenues will slide southward. To imagine Microsoft whimpering out without giving Google and Apple a ferocious fight would be to misunderstand the company itself.

Microsoft has been more than willing in the past to throw ridiculous money at a project just to keep the competitors on their toes. It has spent billions of dollars on search (without much success), if only to give Larry Page and Sergey Brin something to think about in the wee hours of the night. It threw a massive amount of cash to unsettle Sony's PS2 Armada without flinching. Whatever criticisms one might level at Microsoft, one can't accuse it of not having an appetite for a fight.

The fact remains that the Windows and Office divisions will continue to generate billions of dollars in cash for the next several years, cash that can and will be used to fuel innovation in mobile computing. By all critical standards, Windows Mobile is good; it only needs a great phone and a large app library to fly off the success runway. Knowing Microsoft, you can never bet against the company attracting a massive developer base.

Then there's Windows 8. All previews indicate that this might be the actual challenger to the iPad, and not the PlayBook or the Kindle Fire or whatever Android monstrosity is being conjured up in Google's labs. Microsoft has entered the fight late, but not too late. The mobile computing market is still in its nascent stages and it'll take at least a couple of years for it to reach maturity. That is plenty of time for Microsoft to polish off Windows Mobile and Windows 8.

Make no mistake: Microsoft hasn't lost this fight. It is still a competitor and it will come down hard when it steps into the ring. Apple will survive the assault, but perhaps not Android.

Microsoft

Things to do to avoid being relegated from the market

- **Build it:** First and foremost, Microsoft cannot let Apple have one more holiday season without a Windows tablet on the market. It needs to

bring something to the market -and that something has to be ready for prime time in terms of hardware, software and ecosystem.

It's not just the Windows 8 software that has to be on point. Although Microsoft is building the operating system, it might be wise to be intimately involved in development of some hardware -to help ensure positive user experience.

On the tablet hardware side, Microsoft will need to meet or beat what's already on the market. To that end, the company has said that Windows 8 will support multiple display resolutions, possibly even beyond that of the Retina display. With iPad in its third iteration and Android-based tablets past their infancy, consumers have an expectation of a mature, seamless and reliable computing experience, not one that is glitch or experimental. Windows-based tablets will be compared to what's already on the market.

One potential advantage is that Windows 8 is nothing like Apple's iOS or Android 4.0, or Ice Cream Sandwich, the Metro-style updating tiles will be a fresh approach to mobile computing, if executed properly.

- **Populate it:** Now that much of the buying public is familiar with at least the concept of tablet computing, Microsoft will have to deliver more than just a tablet and a stellar OS. "Ecosystems are driving purchases these days," Gartenberg said.

In other words, it's all about the apps. Windows Phone, essentially a precursor to a possible upcoming Windows-based tablet, now has 70,000 apps, or less than 5% of the market. That compares with half a million each for iOS and Android.

Microsoft isn't ignoring app development; it just released the developer's kit for Windows Phone 7.1.1, which can also run on the Windows 8 Consumer Preview release. In addition, Microsoft and Nokia announced an investment of about \$12 million in AppCampus, a mobile app development program at Aalto University in Finland, to develop new apps for the Windows Phone platform.

- **Sell it:** Price is an area where Microsoft could have a check in the win column. In just the normal desktop world, Windows devices were always less expensive than Apple machines. If Apple is the ultimate hand-held machine of the computing market, Windows-based machines have been considered sturdy and affordable machines. Keep the price down and sales may take off. That said, the premium price of iPads hasn't really hurt Apple's sales any.

Another potential sales pitch could be aimed at the business market, long comfortable with Microsoft products. The goal, however, is to not take a page from Research in Motion's BlackBerry Playbook.

Why Windows 8 tablets might rule?

When you look at the tablet landscape, it doesn't look like a very even battle going on. On one side you've got Apple, the Goliath, destroying the competition with its iPad. On the other side of the field you've got Android, slumping under Apple's onslaught, suffering from low sales due to a number of factors, including high prices, low customer awareness, and the dreaded fragmentation word. The new entrant in this battle is Windows.

Taking a look at the hard facts of the technology industry, one finds Microsoft is probably the most familiar. Anyone who has ever dangled a toe into technology knows who and what Microsoft is. Not only that, but the vast majority of PCs run a flavour of Microsoft's Windows operating system,



Windows 8 Tablet

considered to be easily the single most popular operating system in the world. That's some brand advantage, and brand advantage has some serious clout when it comes to buying incentive and familiarity.

Android's set apart from Windows (for obvious reasons), and

while that distance distinguishes Google's flagship OS as its own beast, it also creates a sense of confusion and frustration in non-savvy users. Apple, too, is different; but under the direction of Steve Jobs Apple's iOS chased the "experience" and caught it, making the new interface effortless in the war for the hearts of users.

Windows 8 won't have to clear any hurdles of familiarity. Consumers already use it every day at work, and they come home and use it in the evening, too. It's installed in many vehicles and devices, more than many would suspect. Some would say avoiding Microsoft's reach is almost as difficult as avoiding Google's on the internet; they wouldn't be wrong.



Windows 8 Homescreen

Usability

To someone coming from an old Gateway desktop into a brand new Ice Cream Sandwich Android tablet, it's a whole new world. Google and its hardware vendors assumed, it seems, that consumers buying Android tablets already had some experience with Android, or with Apple's iOS in the worst case. That leaves a large demographic of users coming from feature phones with little experience with the internet baffled in the face of Android's cold GUI.

Simply put, Windows has a huge advantage that it can capitalize on to make Windows tablets seem like home to users.

Applications

Microsoft's got everyone beat here. Documents are "Word docs" by default. Microsoft Outlook dominates email, from home to corporate clients. Whether anyone wants to admit it or not, Internet Explorer is still the king of browsers. When you look around, Microsoft isn't winning the game of applications, it's running it. All Sinofsky and co need to do is keep that familiar app set going on the tablet. If you reduce the learning curve on the applications you use, people will be comfortable with your product. Introducing a touch interface is just going to make the experience seem new and wondrous, not a chore.

As far as a base of applications, there's not going to be the shortage that Windows Mobile has. While Windows 8 is technically a new operating

system, it has its roots spread all the way back to Windows 3.11, when floppies were the thing and a GUI was future tech. Windows can take that familiarity to the tablet and make those tablet-conformed applications an old friend rather than something new to conquer. As it stands, with the Windows Store, and cross-platform Metro apps written in anything from C++ to JavaScript, Windows 8 is looking very strong apps-wise.

Fragmentation

The word that sparks endless pages of internet trolling and hate, fragmentation. A nightmare for Google, surely, fragmentation is what keeps you from having the latest and greatest update on your not-so-new Android device.



Windows 8 Marketplace

Android proponents like to play it off as something that may have been an issue before, but not something that's rearing its ugly head now. That's not entirely true, however.

Microsoft isn't going to have this issue at all. Windows 8 is, well, Windows 8. It'll be on your desktop, and it'll be on your tablet. You won't have to worry about applications being backwards compatible, you won't have to upgrade to the latest Microsoft tablet to take advantage of the newest iteration of Windows or be left in the dust, except in the sense that the PC world has always had an end of the line for old desktops. Fragmentation won't exist in Microsoft's paradigm of the tablet world, and that's a really good thing.

Price

If you peek around at the tablet ecosystem, it's pretty easy to see why Android tablet sales are so low. If you take the above statements and then factor in

almost a thousand dollars in some cases for a tablet that has no promise of a single update as soon as you walk it out the door, you should have a pretty good idea. Apple gets to set the stage for pricing with its mammoth lead in the tablet market, but Android tablets have yet to take advantage of this and undercut Apple's pricing. It's corporate suicide to many, and such a turn-off that it seems like manufacturers and carriers alike are trying to make Android fail.

Microsoft has a huge chance here. Undercutting Android's pricing across the board with its tablet offerings will give Redmond a mighty advantage, especially in this economy. The numbers show that consumers want tablets, and want them bad. It's obvious that Apple is giving them the price point plus the ease of use to make Cupertino the overwhelming winner thus far. Microsoft's familiar Windows interface plus an aggressive pricing model could put a stranglehold on Android tablets so tight they'll never get their groove and take off.

The long and short of it is there's room in the tablet war for a third contender, and Microsoft has a chance to really make a splash on the scene.

BlackBerry PlayBook

RIM has been billing their BlackBerry PlayBook tablet as an iPad killer ever since it first revealed it way back in September 2010. With a greater focus on enterprise usage than the iPad 2, its smaller 7-inch form factor makes it a very different proposition from that of Apple's slate offering.

There can be only one slate at the top of the tablet pile; does the PlayBook have what it takes to knock the iPad off its lofty perch? With pricing and storage relatively balanced across each device, we focus here on breaking down the key tablet features to see which tablet is worthy of your cash.

Size and Design

The first and most obvious difference between the two tablets is their size. The BlackBerry PlayBook is a 7-inch device with dimensions of 193 x 130 x 10mm and a weight of 400g, while the iPad 2 is a 10.1 inch tablet with dimensions of 241x186x9mm, with the top-spec 3G model weighing a heavier 610g.

iPad 2 has a physical home button on the bottom of its bezel; the BlackBerry PlayBook has no buttons on its front side, making for a very slick and smooth front face, even if the black boxy design of RIM's unit is a little uninspired overall. The tiny power button on the PlayBook is a chore to find though.

Processor

The PlayBook uses a 1 GHz Cortex-A9 dual-core processor, which results in a very slick, lag-free user experience.

Operating System

RIM chose to adopt the relatively-niche QNX operating system for the BlackBerry PlayBook. Much

like using a BlackBerry phone, QNX focuses on multi-tasking and gesture-based controls for quick navigation. It's a clean and simple interface with lots of room for customisation as well as a smart notifications bar.



BlackBerry PlayBook

Apps

BlackBerry users have never had much joy when it comes to the paltry offerings the App World store sells, but the news that the PlayBook wouldn't even support the existing mobile applications currently on offer came as a true shock. As a result, only a minuscule amount of apps are available to PlayBook owners in comparison to iPad users. Eventual Android app support will address this somewhat, but the few native BlackBerry apps are a disappointment.

Video

It's easier to get your own video files on the PlayBook, and it seems happier to play back a greater variety of file types without conversion, it lacks a dedicated video store.

Web Browsing

The PlayBook's browser is every bit a match for the iPad 2 in terms of web surfing ease, with equally intuitive gesture controls and accurate page rendering. It pips the iPad 2 to the post thanks to its excellent Flash rendering however, making the whole web truly available on the go.

Email

A strange point to highlight you may think, but email support may be the real deciding factor for BlackBerry-owning, tablet fence sitters. While online webmail services are accessible to both the iPad 2 and PlayBook, only the

iPad 2 has a native email client available offline. The PlayBook, despite its enterprise marketing and coming from a stable of excellent email clients on mobile devices, makes use of a clunky bridge system that requires a BlackBerry phone synced with the tablet to view emails offline. It's a secure system, but far from intuitive, and a real step-backwards from RIM considering they pretty much pioneered email on the go with BlackBerry smartphones.

Aakash 2: The Indian cheap mass market Tablet

Aakash 2 is the latest version of the Indian government initiative, the Aakash project which aims at providing a tablet to every child of India.

Hardware and Design of Aakash 2 tablet

The Aakash 2 tab is available in black colour with a boxy design. The weight of this tiny priced tablet is 350 grams. Its build solidly to cope with the frequent falls in the monsoons of India. The dimension of Aakash 2 are 7.5 inch (190.5 mm) long by 4.67 inch (118.5 mm) wide with a thickness of 0.62 inches (15.7 mm). The low weight and handy dimension of Aakash makes it possible to carry in your pocket. Aakash has 2 USB ports for plug and play connectivity of external devices. A video co-processor is added for better rendering of graphics on video playback. No SIM card is provided in Aakash 2 but it's present in its commercial version Ubisalte 7+.

Aakash 2 is powered by a solid ARM Cortex A8 700 MHz processor which delivers you about 1500 MHz if we are comparing it with the ARM 11 processor which is present in BSNL tablet. This means it's about 1.5 times faster than BSNL tablet even with lower configurations on paper. RAM of Aakash tablet 2 is 256 MB which lets you execute most of the apps function smoothly. The internal memory of the tablet is 2GB flash storage and with the use of simple memory card (SD) card you can extend it by up to 32GB. The battery life is also enhanced and instead of 2100mAh battery of Aakash 1 you will get 3200mAh battery in Aakash 2 tab which can runs for 3-4 hours smoothly without any power supply. Aakash 1 suffered a problem of low memory and frequent system freeze—worked upon in this newer version and looks better than before. It still, however, has the following issues:

1. The screen is rather unresponsive.
2. It also heats up really fast; this means in the heat and dust of India, it could face problems.
3. It connects to the internet only using Wi-Fi. Which means that if a student is travelling or in a room that doesn't have Wi-Fi, he's stumped.

4. Playing YouTube videos is easy but stopping them is irritatingly difficult. Strangely, the tablet wouldn't open any of the movie files on a USB drive – even common formats such as .avi and .flv.



Aakash 2

Notion Ink Adam

Hardware

Adam's actually a pretty handsome tablet, and it sports a unique design, whereas most every recent slate is a variation on the original iPad formula, Notion Ink endowed its offspring with a sizable rump that serves a variety of functions. It holds a pair of stereo speakers, one at either end, with the unit's three-cell battery sandwiched in between; it serves as an axis around which the swivelling camera rotates; and it makes for a fantastic grip. The 3.2 megapixel camera attached to the Adam has one neat trick – it swivels to swap between front- and rear-facing orientations and it automatically flips the image when it detects which way is up.

The upper left-hand corner of the bezel is where you'll find the Adam's four capacitive touch buttons. They're not backlit, provide no vibrating feedback, and are in a position where it's easy to brush them with stray gestures. There's a lot of fuss about connecting tablets to keyboards and televisions as of late, but the Adam doesn't need a proprietary keyboard, cables or docks because it's got two full-sized USB ports and a full-sized HDMI slot. Adam can do a full 1080p display mirroring over the HDMI port.

Display / touchscreen

Adam might be the first mass-market device to ship with a Pixel Qi screen, and a matte one at that. The Pixel Qi's reflective mode most certainly does work, and it does its job well, saving hours of additional battery life and making the screen quite viewable outdoors.

Software

Technically, the Adam runs a build of Android 2.2 but you'd be hard-

SPECIFICATIONS	
Processor	700 MHz
Video Processor	HD video co-processor
Connectivity	Wi-Fi (802.11 a/b/g/n)
Screen Size	7 inch.
Screen Resolution	800×480
Screen Type	Touch Screen Capacitive
Internal Memory	2 GB
Random Access Memory (RAM)	256 MB
Expandable Memory	Upto 32 Gb with SD card slot
USB support	2 USB 2.0 Ports
Audio support	3.5 mm jack
File extension Supported	DOC, DOCX, ODT, ODP, PDF, TXT, XLSX, SLS, PPT, PPTX
Battery Life	3 hrs 3200mAh li-po battery
Dimensions	190.5 mm (7.50 in) Height
	118.5 mm (4.67 in) Width
	15.7 mm (0.62 in) Thick
Weight	350 gram (12 oz)
Warranty	1 Year replacement warranty

pressed to determine that Notion Ink has skinned the entire thing with a user interface it calls Eden. The Eden UI is actually composed of a number of innovative concepts, like the Panel View, which eschews the standard icon-filled home screen in favour of a series of miniaturized apps that you can scroll through. Drag and drop an app from the ribbon onto the desktop and the Adam will attempt to open it in Panel View.

Browser

Notion Ink's tabbed Webkit browser looks and feels great at first, and loads pages fast (full desktop webpages, mind you, not the mobile versions). It sports snappy inertial scrolling, has a host of shortcuts for bookmarks, text selection and screen grabs, and there's a nifty virtual thumbwheel that lets you add, kill, and swap between tabs. Assuming you have the APK handy, it'll even do Flash.

Performance / battery life

The dual-core 1GHz Tegra 250 actually makes for a fairly potent device, with the Adam scoring between 1,700 and 2,100 in Quadrant, calculating 37 MFLOPS in Linpack, achieving 42.6fps in Nenamark, and speedily playing a variety of Android games, whenever the Adam decides it is in a good mood and let them

run without crashing. The Adam's sensor package performed far more quickly than many other tablets we've used, getting us a super-speedy GPS lock in maps, and nigh-instantly rotating the screen when we shifted the Adam's orientation.




Notion Ink Adam

The Pixel Qi screen extends the Adam's battery life, but it's still not as good as it should have

been. The Adam managed only 8 hours, 38 minutes with the backlight off. Using the Pixel Qi's full colour LCD, it managed only 5 hours, 52 minutes before that 24Wh battery died.

At a glance

Music is just a play/pause toggle on the home screen for tunes you've got running in the plain Android app, and the video player seems to be a re-skin of Android's default Movies app which doesn't play any additional codecs. Notion Ink's Settings pane is actually pretty neat, turning Android's nesting menus into a visually pleasing, intuitive full screen. Nimbuzz is bundled for chat, Quick office for basic productivity and Solaro Mobile for an educational twist; all require registration to begin with. OsmAnd is your Maps replacement, with downloadable (and locally cached) open-source maps for different regions around the globe, with the unfortunate compromise of being rather slow. Mail'd is the Notion Ink's IMAP/POP3 client (reportedly based on the popular K-9 Mail for Android) that can automatically set up an IMAP version of Gmail with just your email address and password. 



CHOICES, CHOICES, CHOICES

With the explosion of tablets as a “hot” category, manufacturers are literally crawling out of the woodwork, and that means there are a lot of choices for you. In this chapter we’ll look at some of the well known tablets. Some of the lesser-known ones have been covered in this month’s issue of Digit.

Benchmark: New iPad3

iPad is always considered the benchmark for other tablets, and its release is awaited by consumers and reviewers alike. Rumour mills run at full speed in weeks (or even months) prior to its launch. Apple’s calling the third revision the ‘new’ iPad. Let’s see what it has to offer.

Apple on their homepage have described the iPad as the 'Resolutionary', and not without reason, thanks to the iPad's new 2048 x 1536 Retina display. It's the best display ever featured on a tablet and possibly the best display ever on a mobile device. The display has a Pixel Per Inch (how densely the pictures are packed). measurement of 264, slightly lower than that of an iPhone (326), but then you are expected to hold the iPad further than a phone, so it makes up for it. To put it in perspective, remember that awesome Full HD TV you bought not too long ago? Well the iPad with its (relatively) puny 10" screen has a million more pixels than that. Yes.



The Aptly titled new iPad

In terms of build quality, the device feels quite solid. The new iPad is just a little bit thicker and heavier than its predecessor (the additional weight is courtesy the bigger battery). However, it feels neither big nor heavy. It's carved from a chunk of aluminum, except for an internal cavity which houses the battery and other internal components. If we didn't know better, we'd say it's a monolithic device.

As far as communication goes, the new iPad is well equipped. The 4G version comes with all forms of cellular radios like LTE/ MTS / HSPA / HSPA+ / DC-HSDPA (850, 900, 1900, 2100 MHz) and GSM / EDGE (850, 900, 1800, 1900 MHz) . Apple's got nearly every form of telephony covered in their newest beauty. The WiFi-only models obviously lack 4G of course, but offer 802.11a/b/g/n connectivity along with Bluetooth 4.0.

Moving on to the iPad's muscle, i.e. the processor and GPU, the iPad is powered by an A5X chipset instead the A5 chip found in the iPad2. What Apple has done is kept the same dual-core CPU as the iPad 2 [and is confirmed by identical scores in CPU benchmarks] but paired it with a new quad-core graphics component which drives all those 3 million pixels on the screen, which also means you can play really demanding games with hyper-realistic graphics.

Now that the iPad has captured your interest, let us see how well it captures images. The camera modules on the iPad2 weren't particularly good, but the new iPad changes all that. It has a 5-megapixel unit consisting of the five-element f/2.4 optical lens with stabilization. 5 Megapixels might seem little by comparison to 8/12 (and now even 41 on Nokia PureView) Megapixels found on flagship phones, but the images are of a very high quality. Video recording has been stepped up too, to 1080p from the previous 720p, and again we saw a nice increase in quality over the former iPad.

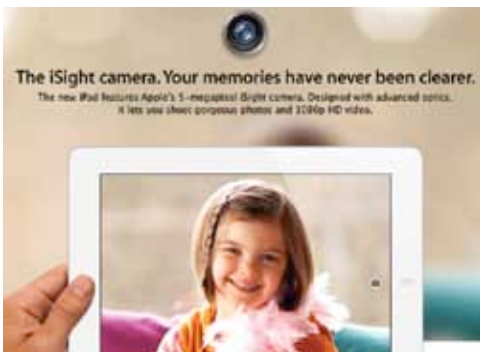
The iPad is a location aware device and has a dedicated GPS unit, aided by a 3 Axis Gyroscop. On the 4G version, it can find its position using A-GPS, Tower Triangulation or WiFi networks. It also packs a 3 axis Accelerometer and an ambient light sensor.

As would be apparent by now, driving all those pixels on the screen requires a quad core GPU alongside a Dual Core CPU, which in turn would require a powerful battery. The 'new' iPad doesn't disappoint, with a rated capacity nearly twice that of the previous iPad 2. Apple rates the new iPad at 10 hours of casual surfing on WiFi or nine hours on 4G, which is pretty impressive given its Retina Display.

In terms of software, the new iPad runs iOS 5.1. If you were expecting the goodness of Siri in the new iPad, you'll be disappointed, as Apple has decided against including Siri in the iPad. Apple has, however included voice dictation support throughout the device. iMovie and iPhoto look great on this clear a screen, leveraging the improved resolution in their updated versions. Making movies on the new iPad will be amazing, with its Storyboard feature. The iPhoto

app is in a league of its own, bringing awesome changes to the way you edit, share and tag photos. iSight is the camera application, which is handy since the device now boasts an improved 5MP camera.

iOS 5.1 brings with it the goodness of iCloud. You can save and share your docu-



The press release regarding the new shooting capabilities of iPad

ments, photos, videos, contacts, bookmarks to iCloud, and your applications and data will be seamlessly synced across any other iOS devices you own.

Before we wrap up, we would like to reiterate the importance of the display. The new iPad screen offers a considerably increased contrast and gamut, meaning colours are not only brighter and more striking but more accurate. The colours aren't wild and saturated as they are on Samsung's Super AMOLED Plus displays, but sport a neutral colour temperature. If you're disappointed Apple didn't do more with the new iPad, then we believe all you need to do is look at the new Retina display for yourself. Take more than a passing glance and you'll be convinced.

Starting at an official price tag of Rs 30,500 in India (and adding 6k for a 16 GB upgrade) for the WiFi only version, it isn't probably the most value of money tablet, but is definitely one of the most exciting ones.

Android Tablets and Blackberry

For those who aren't fans of the iOS or the Apple ecosystem but choose to support alternatives like Android or BlackBerry, we present here some worthy contenders for the new iPad. We will look at some of the most important non-iOS tablets from across different price segments, giving you a peak into what others have to offer.

Amazon Kindle Fire

This tablet has gained a wide fan following thanks to its \$199 price point and has gone on to become the widest selling Android tablet. It comes with its own browser called Silk, where the web pages are partially rendered and processed in the cloud and then the optimized version is sent to the device, relieving it of some of the processing. The display has also been toughened to be 20 times stiffer and 30 times harder than plastic, and each device comes with a month's subscription of Amazon Prime.



Reads book, Plays Angry birds, Fast browser for 200 USD

Motorola Xoom

Xoom's claim to fame was being the first tablet which supported Honey-Comb, the Android 3.0 version optimized for tablets. The company now states that the tablet is upgradeable to ICS, or Android 4.0, bringing with it a slew of big-fixes and feature improvements. It retails for around 400 USD without wifi, which is about 100 USD lower than the iPad.

Asus Transformer Prime

This is a beast, in every way. It was the first tablet ever to feature a quad-core processor, and typically beats every other tablet in most benchmarks. On the outside it comes

with a detachable keyboard which has a built in touch pad and battery pack, giving you a battery backup of almost 18 hours! It is built solidly, and seems polished enough to compete with an Apple product.



Xoom your way to browsing glory.

While we'll never

quite know if it's a tablet or a laptop, what with an 8 megapixel camera thrown in, we strongly recommend looking into this one.

Samsung Tab 10.1 and V [Samsung Tab]

Built on the super successful Galaxy line (including the Galaxy S, the Galaxy S II and now the Galaxy S III), it has a reputation to maintain. One of the oldest players in the arena, the tablet was famously featured on Karan Johar's talk show, Koffee with Karan. Currently it comes in two models - the 10.1 and the slightly more powerful



Our favorite of the lot

10.IV. The tablets are capable enough to run ports of Linux distributions, and a port for Ubuntu is in the works.

Blackberry Playbook

If you're a corporate expecting who's expected to sleep in suit and strut an always ringing BlackBerry phone around with you, then this tablet might just be for you. The only tablet in this list to run on BlackBerry OS [now at version 2.0], reception to this tablet has been



The tablet with a reputation to hold

lukewarm, but has its own set of fanatics, the fact that it means business is clear by 3 MegaPixels front camera for video conferencing.

Cost Conscious Options

Almost all the tablets mentioned above [with the notable exception of Kindle Fire], come with a price tag of around ₹30,000. If you don't intend to shell out that kind of money but don't want to miss out on the Tablet wagon, you needn't miss out. Most of the options listed here are sourced by OEMs from Chinese manufactures and re-branded by Indian companies who provide



The fun for the serious ones

support and warranty for them. We've even included tablets which run ICS 4.0 at this price point

UbiSlate/Akash

No introductions are needed for our much hyped and equally delayed home grown tablet. It's main USP is the price point of ₹ 2999. Even at this price, it manages to include an 800 MHz ARM-Cortex processor, a co-processor for video rendering and WiFi and GPRS radios, on an Android 2.3 base. It isn't as powerful as some others, but it is hard to complain at this price. Another thing to note is the resistive screen as compared to capacitive panels found in others. The only problem is, it's almost always sold out.

HCL ME U1 tablet

HCL ME U1 is the latest budget Android 4.0 offering from HCL Infosystems. Sporting a 7-inch capacitive multi-touch screen with a resolution of 800X480 pixels and a 1GHz processor, HCL ME U1 packs in 17 local, ready to use appli-



The sold out tablet, for under ₹ 3000

cations. The device sports a front 0.3 MP camera for video calling, 512 MB RAM and internal memory of 4GB, expandable to 32GB. The device also includes Wi-fi connectivity and a USB, mini-USB and a Micro SD card slot. 3G is not supported internally, but can be accessed by means of an external. Internally, the device houses a 3600 m Ah battery and retails a competitive price of ₹7999.


Micromax Funbook tablet

The Funbook is a neat little 7" Android 4.0 tablet available for a mere ₹ 6,499. It's probably one of the cheapest Android 4.0 tablets around, and is powered by a 1.2 GHz Cortex A8 processor and has a 2D/3D graphics processor for all your video playback and basic gaming needs. It supports multi-touch gestures like 512 MB RAM, 4 GB of internal memory, WiFi and



Fun on a budget

3G connectivity completes the hardware specification. The device also features a 0.3 megapixel front facing camera for video calling. At 2800mAh the device should give a reasonable amount of runtime, and comes preloaded with handy apps like Documents on the Go, Adobe PDF, Adobe Flash,

YouTube, Text Editor. Micromax has gone all the way to provide the best out of the box experience and packs in a free Tata Photon EVDO data card and 1GB of free data download for two months. 



IS A TABLET RIGHT FOR YOU?

We know suddenly today, it's become difficult to try and imagine how things were just a few years ago, and remember a time without tablets. You would realize within just three years after the original Apple iPad came into stores, a slew of tablets started entering the markets from all fronts and a multi-billion dollar tablet market was created. Ever since then, we've been seeing numerous manufacturers trying to get a piece of the pie with continuous advancements and upgradations. Apple itself has come out with its third version of the iPad already. It still dominated the market and sold around 3 million units in three days when it was launched last month.

As per IDC, around 28.2 million tablets were purchased in Q4 of 2011, and literally more than half of them were iPads. Google, the maker of Android is another important player in the tablet market. It also has been

able to occupy a decent market with its Android operating system. This is also contributed to by Amazon, which produces an extremely budget tight alternative—the \$200 Kindle Fire, which commands about 16.8% of the market in terms of sales right now. The most interesting aspect of these statistics is that the combined sale of tablets has risen by up to 155% compared to the same time period in 2010. This definitely shows that the tablets are here to stay.

But now the question is: is the tablet right for you, and if you choose to decide yes, then which tablet is right for you? Considering the options, you



The mighty iPad, along with Samsung Galaxy Tab and the Playbook

might already be interested in an iPad or one of the many cheaper Android tablets. You even have the BlackBerry PlayBook in the mix as well as the Microsoft Windows 8 variety coming in. But let's see what key factors you should be considering before making the decision.

Do you really need a tablet?

Let's look at this question from another angle. To put it simply, tablets might not be able to really fulfil all your digital computing needs. They still cannot act as alternatives or replacements to your full-fledged computers or even your smartphones for that matter. In a way a tablet is a big touch screen media device that brings together your portable media player, and a simple gaming device and has a larger screen. A lot of tablets do have features for mobile services, but they are still neither a good phone nor can be used to make phone calls via a traditional mobile provider. While you can still handle the issue of productivity on an iPad or an Android tablet, which are fairly

powerful, you won't get a system level even close to that of a conventional desktop operating system, like you'll find on a PC or a Mac. You even have to consider the fact that these being mere slates, they don't normally come with a hardware keyboard. So they can't be very work driven, their primary function still stands for media consumption.



The world of tablets

But tablets do have a major upside and a few advantages over traditional laptops and phones. They offer a more convenient portable way of checking your email, browsing the internet, e able to have video chat on the fly, watch movies, and listen to music, and play games, with a much bigger screen yet very portable. The higher screen real estate compared to your smartphone is probably something you do not need one, but if you do want a tablet, then read on.

Picking the right Operating System

Similar to buying a full-fledged computer, in case you are buying a tablet, you will need to pick a side. Currently, the main contenders are definitely the Apple with its iPad, and Android with its many hardware choices including Amazon, Asus, HTC, Samsung, Toshiba, and others. If you choose to come back next year Microsoft, with Windows 8, its tablet-friendly Metro interface, might also turn out to be a very serious contender. In a small way Blackberry also puts in a fight with its Playbook.



The Nokia Windows 8 tablet

Apple's iOS is the mobile platform used by the iPad, the same for the iPhone and iPod touch. On the iPad, iOS is extremely similar to the way it works on the iPhone, with certain changes to take advantage of the tablet's larger 9.7-inch screen. The built-in iPod app on the iPad, for instance, has an extra side menu for additional navigation options that wouldn't fit on the iPhone's screen. Generally speaking, the great strength of Apple's iOS is that it is very intuitive, and there is a wide selection of iPad apps that you can buy right on the tablet from the Apple App store. More than 200,000 iPad specific apps currently and all these work uniformly well with very few exceptions.

Google's mobile OS, Android, is a more complicated story though. Besides having your choice of hardware from several manufacturers, there are a few different iterations of Android floating around on tablets currently. The latest version, Android 4.0 (Ice Cream Sandwich), which combines two platforms and takes them forward, Gingerbread the OS used for phones and Honeycomb the one used for tablets. It is now a single operating system for all Android devices and was released back in November, but we've only seen it on a couple of tablets so far. Most manufacturers have made the move to Honeycomb, but some are still making tablets with previous versions of Android that are meant for phones with smaller screens. Amazon with the Kindle Fire, and Barnes and Noble, with its Nook Tablet, each use its own highly customized version of Gingerbread, which, for the most part, in the cases of these smaller 7-inch tablets, is successful.

But if you are going for the larger screen tablets, you want to make sure you are getting Android 4.0. The good news is that most Honeycomb tablets will be

upgradeable to Ice Cream Sandwich. Just when is the question. The OS does have major benefits none the less, including high configurability, an excellent notification system, fast Web browsing, and seamless integration with Google applications like Gmail, Google Maps, and Google Talk for video chat.

Lastly, there's RIM's QNX operating system, which runs on the company's BlackBerry PlayBook tablet. Despite having a high end user interface with some very promising features, like tight integration with BlackBerry smartphones, the PlayBook was released well before it was ready, and while RIM has added features since then, the tablet has failed to gain any traction in the market, despite Blackberry dropping its price by more than 50percent.



Tablet using Ice Cream Sandwich Android 4.0

The place where Android lacks behind is a strong selection of apps. It's tough to say exactly how many tablet-optimized Android apps are available, but it's in the low hundreds. RIM claims to have more than 10,000 PlayBook specific apps on its BlackBerry App World, but many big-name apps are still missing. If you want lots of third party apps for your tablet, right now, nothing out there beats the iPad with its 200,000+ programs and games designed specifically for the tablet. Apple's App Store is very well maintained and curated and offers a wide selection no competitor can come close to claiming this right now, partially because apps made for Android tablets have to work across multiple screen sizes, while iPad apps are designed for a single tablet. It sounds simple, but the variation in size (and manufacturers) complicates

things greatly for Android developers. If a wide range of compelling apps that look good on your tablet is your main priority, Apple is currently the best at it.


Screen size and storage

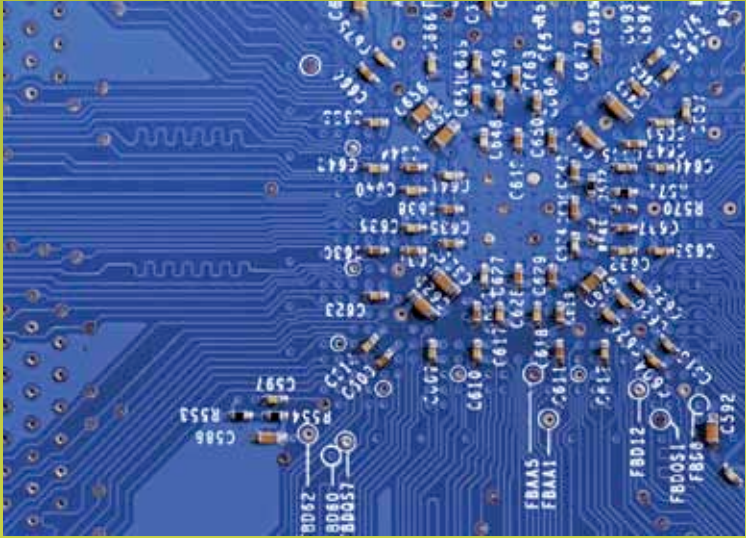
This is probably obvious, but size, both screen real estate and storage capacity is important for many of us. Firstly when someone says 10 inch tablet, this normally refers only to the size of the screen, measured diagonally, and not the actual size of the tablet itself. Apple continues to offer the new iPad and the iPad 2 with a 9.7 inch screen and the BlackBerry PlayBook comes in a single 7 inch variety, which RIM argues gives it the advantage of being able to pocket it. Samsung, for one, wants you to have a choice, so it offers its Android tablets in multiple screen sizes 10.1, 8.9, 7 inches, and even a phone cum tablet hybrid the Samsung Note with a 5-inch display and a stylus.

Screen resolution is important too, especially for ebook reading and Web surfing. A sharp, bright display is extremely important. Right now, the new iPad has a 2048x1536 pixel Retina display and this is the sharpest and best you will find out there. If you're in the market for a 10-inch Android tablet, look for a display with at least 1280x800 resolution. For 7-inch models: The Amazon Kindle Fire comes with 1024 x 600, and is perfectly viewable, even for ebook reading.

Choosing a Tablet: Over a laptop or a smartphone

The weight and portability of a tablet is its biggest advantage over a laptop, but to be very correct, it's definitely not as light as a mobile phone, this stands true even in the case of 7 inch tablets as well. After you hold one on a bus for ten minutes, your hand will get tired. Setting it flat in your lap, rather than propped up on a stand, can also be a little awkward. Again, a 10 inch tablet doesn't fit into pockets most of the time.

As for storage, the more the better, all those apps, when combined with a typical music, video, and photo library, can take up a lot of space. Right now storage maximum is at 64GB of flash based memory, with most of the tablets available in 16, 32, and 64GB varieties. Larger capacity models can get about as expensive as full-featured laptops, though, especially when you factor in cellular service plans. Many tablets come in a Wi-Fi-only model or with the option of always-on cellular service from a wireless provider. Finally, before you buy, make sure you head to your local electronics store to get some hands on time with some different tablets, so you can see which feels and works the best for you. 



TABLET HARDWARE GUIDE

Just as it is important to know all of the different OSES and apps that tablets run, it's also equally important to know about the hardware that runs all that fancy software.

Touchscreen Technology

We have already seen in the previous chapter the two different kind of touchscreen technologies dominating the tablet industry viz- resistive and capacitive. On the hardware side, this can be considered as the most important interface function while buying a tablet. Lets look at a few peculiarities of both.

Resistive

Resistive touchscreens are cheap and affordable, but painful to use. They aren't very responsive because of the inherent technology. User needs to apply a certain amount of pressure in order to complete the circuit and register the touch. This can be done with a stylus and fingernails too. In addition, they also lack the multi-touch functionality rendering many functions unusable. If you plan to buy a tablet strictly for educational purposes with minimum gameplay, tablets with resistive touchscreens will be light on your pocket and you won't miss out much.

Capacitive

Capacitive touchscreens on the other hand, provide a very smooth and pleasant interface for users to operate their tablets. These screens are sensitive and able to register the slightest touch by fingers or any other conducting device. There are styluses specially for capacitive screens which introduces handwriting recognition and enables you to draw on your tablets - Galaxy Note for instance. Capacitive screens aren't as expensive as they used to be. They offer multi-touch and all the other bells and whistles you'd need.

CPUs

Processors, on tablets perform the same functions that processors on PCs perform. This includes execution of apps and games or other functions like accessing web, performing calculations etc. These processors however are usually not the x86 variety and are designed by ARM. The important thing to consider here is the 'clock speed' which determines how quick the tablet is at performing tasks. Generally it is measured in MHz and GHz, it is very important not to overlook this specification while buying tablets.

So far, ARM architectures are the most dominant in the tablet industries when it comes to processors. Cortex-Ax series is the most commonly used amongst tablets. The series has four different designs - A5, A8, A9, A15. Speed and price goes on increasing as we move up the series, and so does the power consumption. Today A8 and A9 are the most popular processors in the market which operate between 600 Mhz to 1.2GHz. Since we are talking about tablets, it is best to have at least 1GHz of processor speed for optimum performance.

These processors come on what is called an SoC or System on Chip. SoCs combine a few modules on to a single chip such as a memory controller, graphics module etc. Companies like Texas Instruments, Qualcomm, and others manufacture processors and SoCs with their own code names such

as Hummingbird or Snapdragon etc. Now processors come in single core or dual core configurations. Software too is being tweaked to make the most of dual core CPUs. These ‘multi-threaded’ software allocate various tasks to run parallelly on two cores. Dual cores help in



Tegra 3 has effectively brought 5 cores into play on a handheld device!

speeding up things, and even in multitasking. Increasing the number of cores however will increase the power consumption of a tablet. There is some amount of heating trouble being reported too.

It is also possible to have a quad-core configuration in tablets. The Tegra 3 chip developed by NVIDIA is functionally a SoC with a quad-core CPU, but includes a fifth companion core. While all cores are Cortex-A9s, the companion core is manufactured with a special low power silicon process that uses less power at low clock rate but does not scale well to high clock rates. This is a chip that one must keep an eye out for in spec sheets.

Storage Space Matters

Storage space, as in laptops and mobile phones, is measured in standard gigabytes (GB). Most tablets are available with 2GB, 4GB etc. as their on-board memory capacity. The important thing to keep in mind while selecting a tablet is whether it has an option to expand its in-built memory. So it is important to estimate the increasing memory requirements of games and apps in different OSes and then plan out your buy.

Android tablets usually provide for expandable memory with the help of SD expansion slots. Generally, a microSD card slot is provided in these tablets to increase the storage space. It is also very easy to transfer data to microSD card using card readers from your computers and laptops. MicroSD cards upto 32 GB are available in market.

Another important thing to keep in mind while expanding your memory is the processor speed of your tablet. Reading might be slow. Also be sure of how much the expandable memory is upgradable to. Look out for the maximum size of memory card specified on the device before buying it.

Inputs And Outputs

These are the ports that add extra features and capabilities to your tablet. It's surely good to have them around and they are an added bonus if tablets provide them.


USB Connectors- Having a USB port on your tablet can reduce your storage woes to a great extent. Some tablets (especially the cheaper variety) can read pen drives and portable hard drives. Also, manufacturers have started writing drivers for popular 3G dongles for particular regions. In short, having a USB port on your tablet will give you a more laptop-like experience with better portability.



Ports on a typical tablet

HDMI out- This feature gives an enhanced media experience for your tablet. You will be able to connect your HD TV with your tablet and play games or enjoy movies on it. A mini HDMI port is available on tablets having this feature.

Sim-card slot- This is an alternative to 3G dongles which can provide you with internet connectivity. It is also helpful if you are thinking about replacing your phone completely with a tablet. Though it is quite weird to hold a tablet and talk, it is always possible to carry headphones or bluetooth to assist you. Not many tablets provide this feature as it is just a bonus add-on to your tablet.

Other features like 3.5mm audio jack, microUSB charging are standard these days amongst the tablets. 



APPS

As we have seen already, tablets are making waves in the current market, and everyone wants to have one. But what's the reason people buy tablets? Most people would answer 'apps' without the blink of an eye. In terms of hardware, tablet PCs are not actually a revolutionising product. Acer and Microsoft had jointly produced a tablet years ago, but the key to Apple's success is that they created a commercial synergy between hardware, software and service. Thus, using the apps available on the App store, the iPad could become a computer, a navigator or a gaming console among many things. You could say that a tablet without good apps is just as good (or dull) as perhaps, cricket without replay.

It's pretty clear that availability of good apps is the key selling point of any tablet. Apple boasts of more than 500,000 apps in its App store, which is miles ahead of most of the competitors out there. The only competition to Apple in the number of apps available is perhaps Android which now, owing to its phenomenal growth rate in recent times, has crossed the 400k mark, which is still a good 100k behind Apple. And the sales clearly reflect that the apps are what sell the tablets. In 2011, the total global tablet PC

sales were around 60 million units, and the iPad occupied a market share of about 35 to 40 million units while the remaining was divided among the other companies. The Blackberry Playbook's miserable sales, owing to the poor ecosystem of apps and developers, would also bear testimony to this.

Since mobile apps are so ubiquitous, they have also had a major impact on the gaming industry. Gaming has always been one of the most competitive industries, and mobile apps have brought a whole new dimensions to it. People are being introduced into gaming through their smartphones and tablets, instead of the traditional gaming consoles. Videogames are being played now more than ever before, even as handheld game consoles are losing their market dominance, and this has given rise to a new breed of gamers: the casual gamer, and the goal of the industry catering to this category of gamers, being to present a pick-up-and-play experience that people from almost any age group or skill level could enjoy. So it comes as no surprise when a recent survey found, that more than 30 percent of app users are moving away from their handheld gaming consoles. But if mobile apps are giving the hardcore gaming industry a run for their money, they are also bringing in new jobs and funds to the gaming industry. Games are the most frequently used mobile apps, and most people are still willing to pay to play. This presents an opportunity to smaller developers to get noticed and sell their game to potentially millions without needing a huge budget or a great marketing campaign. The future for 'casual gamers' looks bright, with Android devices and Apple pushing for larger resolutions. This can only mean more developer support from game developers, which means better games, which in turn can only mean one thing – more gaming.

It is undeniable that mobile applications have triggered a fundamental shift in the way people experience computing and use their handheld devices. It has helped simplify most of the daily tasks in life, probably making us a lot more reliant on electronic devices. About a decade ago, the web revolutionised the way people went about their lives, and now mobile applications are well on their way to replacing web browsers. And with infinite potential for development, it would not need a soothsayer to predict that the mobile app boom will go on for a while simplifying our lives tremendously.

11 coolest apps for iPad and Android

Confucius says “Man who be cool have cool apps on tablet” – So load your tablet with the most pimpin’ apps that will make your friends go ‘Woah!’ The following is a list of 11 Cool apps you need for your tablet.

Google Goggles

Google goggles lets your tablet be your on-the-road search engine. Goggles uses image recognition technology to recognize objects – and returns relevant search results. So information you need about anything is just a snap away. Can also scan barcodes and QR codes to extract relevant information.



Talking Tom cat

Who wouldn't love a cat that can talk? Talking Tom cat is one of the coolest and most entertaining apps out there. Talk to Tom and he will repeat everything you say, with a funny voice. Pet his body or poke his head, and you will get different reactions each time making it fun for all age groups.



Double Twist with AirSync (Android only)

If you are a music freak, and an Android user – this app is perfect for you. It lets you sync music between computer and tablet, as iOS users can do with their devices and iTunes. Its simple UI makes transferring music effortless, and the AirSync feature means you don't need to hook a LAN cable up.



HootSuite

Imagine having all your social networks in the same view, with the ability to post updates in one hit. Hootsuite handles Facebook, Twitter, Foursquare and LinkedIn accounts together and aggregates all your networks into a single home stream. Hootsuite also supports multiple Facebook and Twitter accounts.



Beat the traffic

Traffic jams are extremely annoying and time consuming and Beat The Traffic promises to be our saviour. It's a real-time pocket-size travel report, complete with colour coded maps that reveal where the gridlock is, how fast traffic is moving around it, and how to avoid the jam. A Boon in this Day and age.



Foursquare

It helps you explore the world around you. You can easily tell friends where you are, share pictures, get comments etc. while getting recommendations for where to go and what to get, based on what you and your friends like. Get curated lists of the best spots to go, along with discounts and freebies from businesses.



Mougg

Never lose your music collection again. Mougg puts your music in the cloud, so you can listen from any computer or device. Access your entire music library from anywhere in the world with just an internet connection. Once you have a song in your mougg library it is instantly accessible. Any browser, any computer. Your music on the cloud.



ShowYou (for iPad only)

ShowYou is a fun video app for your iPad. The app brings in popular web video shared by you or your friends, and you can talk about your favourite videos with your friends. You can customize your grid by inviting your friends, connecting to your social networks and following other ShowYou members.



Transparent Screen

Imagine a guy texting while he's walking, and still manages to dodge a lamp-post and an old lady while still at it. It ain't no spider-sense doing the trick, it's this app. Transparent screen makes apps go transparent and overlays them on the camera feed, so you can see the dangers ahead.



Vignette (Android)

If you're into cameras and photo effects, you'll love this. Take a picture, or import it and select from a huge variety of effects – toy camera, monochrome, vivid etc. There are also frames like strip, panorama, and 35mm film. Basically, this app lets you do cool stuff with your photographs in an easy process.



Shazam

Another music related app on this list, but a necessary one. Most of us have trouble recollecting names of songs that we listen to, and Shazam comes to our aid. The app just listens to the song and tells you about it – the name, artist and album. And it is free and unlimited, which means you can use Shazam as much as you want.



Top 11 games for iOS and Android

Games is the most popular app category, and gaming is evergreen. From the Super Mario age to that of Angry Birds, games have always been able to keep us hooked. The following is a list of 11 amazing games for the iOS and Android platforms that are sure to keep you engaged for hours at a stretch.

Backbreaker THD

This is one for the sports fans. This game based on American football represents the pinnacle of gaming on a tablet – Stunning simulation technology, incredible animations and the amazing HD visuals make it a treat to play this game. Enjoy some bone-crunching football action with this one.



Fruit Ninja

Puss in Boots HD: This and the familiar original version might not really put your tablet's graphic ability to the test, but it's sure to keep you hooked for hours together. The main point of this game is to slice up as many fruits as possible with a selection of various blades. Different modes available make the game much more fun no matter the amount of time in hand.



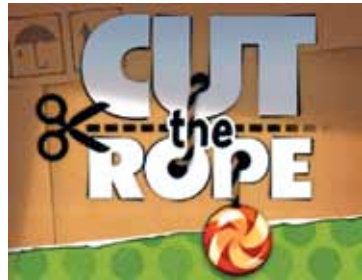
Infinity Blade II

The action RPG game is a top contender for the best game ever on a tablet PC. The first iOS game to run on the Unreal Engine 3, it is a step or two beyond what was accomplished in the original. It is a technically and visually gifted game that does not fail to impress you consistently. Lots to explore and see and learn in this great game. A must have.



Cut the rope

We all love physics simulation games, and Cut the rope is one of the finest in the genre. The gameplay remains fresh throughout the entire game with varying gameplay, and levels that require a lot of thought, accompanied by fun levels that are there just for the sake of performing a cool trick. No wonder it crossed 1 million downloads in just ten days.



Samurai 2

Vengeance: In this game, you follow the story of Daisuke who is on a quest for vengeance against his Archenemy, Orochi. Basically, a hack and slash game, the visuals are stunning and it also gets you thinking with environment puzzles, detect and avoid traps etc. The various health upgrades and attack combos will ensure you stay glued to your tablet for hours.



Temple Run

This highly addictive game just brought endless running games into the forefront again. Whoever knew perspective based games could turn out to be this much fun? Guaranteed to keep you hooked to your tablet, this minimalistic game will keep you swiveling from side to side on your bed.



Asphalt 6: Adrenaline

If racing games are your forte, Asphalt 6: Adrenaline HD is your first pit

stop. Visually pleasing, the game has everything that you look for – Crashes, nitro boosts and stunningly designed sports cars. Good graphics along with fast load times make this game accessible and fun for all ages. Time to send your rivals flying through the air with this one.



Where's my water?

Another highly entertaining physics base game, the premise of this game is ridiculous and very amusing at the same time. Your role is to deliver water to an alligator who is waiting for his shower to turn on. Clear the dirt so that sufficient amount of water can flow into the pipe. Full of traps and hazards, new elements are introduced gradually, holding your interest till the end.



Dungeon Defenders second wave

We included this game in the list just to add in the multiplayer element. This MMO game not just lets iOS and Android users play with each other, but also with PC and PS3 players as well. It is a tower defense game, with lots of action elements – and upto 4 players can work together on a particular mission.



Guerrilla Bob THD

If mindlessly blasting through your enemies is what you long for in a game, this is the game for you. Arm yourself with machine guns, molotovs, flamethrowers, rocket launchers as you fight enemies the guerrilla way. Set in a backdrop through deep canyons and empty towns, you can choose to fight for fame or fortune, or just to stay alive.

Angry Birds, Angry Birds Space, Angry birds Rio

No top games list would be complete without Angry Birds. This worldwide phenomenon needs no introduction, and there are paid and free versions of this game for all platforms on tablet PCs. This physics based skill game is suitable for all ages, and is probably the game of the century.

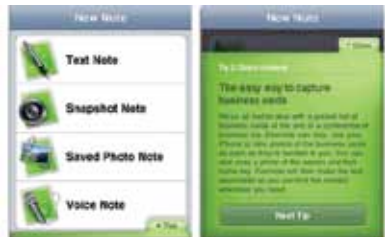


Top 11 Productivity Apps

Being productive is about working smart, and utilizing your time to the fullest and there are lots of tools in the form of apps, that will help you to do exactly that. The following is a list of 11 apps that will definitely increase your productivity:

Evernote (iPad, Android, Playbook)

An all-in-one note taking application, with Evernote you can create text, photos, record audio notes and even sync all your notes to your desktop mac or PC. You can make shopping lists, plan trips, write stories, take notes – the possibilities are endless. In short, it is a must have app for anyone with a tablet.



Dragon Dictation (iPad)

Typing everything down can be very time consuming and irritating, and Dragon Dictation relieves you from just that. It's a voice recognition software which lets you record your voice, and see it in text form in almost no time. You can record a phone call, or



keep your hands free while sending an E-mail message – Dragon Dictation definitely saves time and effort.

Dropbox (iPad, Android, Playbook)

No productivity list is complete without DropBox, and If you haven't been living under a cave, you must have already heard of it.



Dropbox is the easiest way to store and share your files. With Dropbox installed, you can easily access your files on any other computer that has Dropbox. Best part? It's free.

FTP On the Go (iPad)

This app lets you change or update your website from anywhere. FTP On the Go helps you view and edit any HTML, CSS, JavaScript, PHP or ASP files on your server. It is also compatible with JPEG, PDF, DOC, XLS and PPT files, as well.



File Manager HD (Android)

In an Android tablet, adding or moving files around can be a royal pain, and a file browser of some sort is absolutely necessary. That's where File Manager HD comes in. Handles file browsing in both list and Grid views, making it easy. Best Part? Built in LAN browser ensures you don't use cables at all. And yeah, it's free.



Fantastical (iPad)

Fantastical is one of the best and most attractive calendar Apps up for grabs. It is a great way to keep track of events, and can also automatically recognize the location of your event and invite people from your address book to it. It



is quick, easy and compatible with iCloud, Google Calendar or Yahoo! Calendar accounts.

Dataviz Documents to go (iPad, Android, Playbook)

It is an all-in-one application that allows you to edit, view and create MS Word, Excel and PowerPoint files. It also lets you view PDF, iWork and other files and attachments. It also has a desktop application to provide 2-way file synchronization.



Instapaper (iPad)

Instapaper is one of the most simple, and useful apps out there for the iOS. It lets you save online articles for later reading using a special browser bookmarklet. So, when you find something you want to read, but don't have the time – a simple tap would ensure you are able to read it when you have the time.

1password (iPad, Android)


It can be extremely annoying if you can't get access to your data when and where you need it. And your average password manager would not let you sync two devices that support different platforms. But not 1password - It's extremely efficient and easy to use. Password sync needs a Dropbox account, but lets you keep the master copy in the Dropbox account for easy access anywhere.



Sparrow (iPad)

Managing emails can be very frustrating and time-consuming, and Sparrow delivers the most simple and fast way to manage an overflowing inbox. It is a minimalist application which includes great customisation possibilities to "Get Mail Done" in the easiest way possible.

Roambi Visualizer (iPad)

Want to make your business presentation that much more visually exciting but don't want to spend too much time on it? Roambi is your go-to software. It takes your business report data from excel, Google Docs and lots others, and turn that data into interactive visual charts to help crunch your analytics numbers. 



ACCESSORIZE THIS!

Why accessorise? Once you've got the tablet that suits your needs, the first thing you'll be tempted to buy will be accessories that go along with your tablet. While accessories such as keyboards and cases can help you enhance the functionality of your tablet, a personalised skin that matches your mood can help you make a style statement. Other accessories such as docks can enhance your music experience and while some accessories can almost transform your tablet device into something you never thought possible.

Accessories is a huge aftermarket business. Manufacturers come out with all sorts of accessories for tablets. There is however a clear leader in this space when it comes to platform preference. Apple tablets enjoy a larger

accessories ecosystem resulting in a much broader range of accessories than their Android counterparts. Form factor fragmentation is to blame for this imbalance. Android tablets come in so many shapes and sizes, it's understandable if manufacturers only come out with a wide variety for popular ones like the Samsung Galaxy Tab.

Types of accessories

Skins

Skins are a nice way to show-off your tablets. Experimenting with your skins and changing them frequently will help you maintain that novelty factor. There are plenty of skins available online and in local stores. Most skins available online are for iPad2 because of its standard design. There are few amongst the popular Android tablets too. We did manage to find quite a few results while going through Flipkart and ebay. Here are links for ebay - <http://dgit.in/jrM1CT> and Azmer- <http://dgit.in/KqEmNP>. Apart from these, many local shops offer customized skins for your tablets just like your laptop skins.

Cases

Cases unlike skins provide style as well as protection. There are some special tough cases that give extreme protection from falls and there's even a case that's completely waterproof so you can take your iPad with you into the shower. So the next time you want to give your three year old toddler your iPad to play with, don't forget to put your precious device in one of these tough cases. Even Apple's own SmartCover is



Cases for the iPad come in many attractive forms

a kind of case. It even interacts with the iPad at a software level. There are apps such as Evernote that utilise the folding functionality of the smart cover.

Keyboards

The one thing that tablets have always lacked is the kind of tactile feedback that nothing else but a keyboard can provide. If you have to deal with emails

and writing articles or stuff like that on regular basis, it becomes quite uncomfortable to work on tablets since half of the screen size is occupied with the virtual keyboard. Having a physical keyboard will not only help you utilise your screen size better, but also reduce your typing errors. Also, the physical keyboards are not too thick, thereby making it easier to carry them along with the tablets. There are Bluetooth keyboards which pair with your tablet and function just as well without any wired connections. There are even some funky gadgets like projected laser keyboards as well.



Logitech Keyboard for the Galaxy Tab

Camera accessories

These are basically used to boost the camera capabilities of your tablet. There are different types of lenses, such as zoom lenses, macro lenses, 360 degree panorama lenses etc which increase that particular functionality of your Tablet's camera. You can have one of these if you don't want to miss out on clicking amazing pictures with your tablet.

Docks

Docks make for a nice charging station and also some added functionality. Most docks have inbuilt speakers. Some provide remotes so you can sit back and control your music from anywhere. Some docks even have swiveling, height adjustable stands that let you angle your tablet perfectly for say reading an eBook or watching a movie or video.




The iDrift game controller accessory

Battery packs

Products like CoolerMaster's Power Fort give your tablet that extra dose of juice when it's in desperate need of a charge. Battery packs come in different capacities denoted by the charge they can deliver in mAh.

Crazy stuff

Accessory makers have come up with some really crazy stuff for tablets. For instance there is a cable from Griffin called GuitarConnect which lets you plug in your guitar and use your iPad as an Amp. Pair it with a custom app called iShred and you can even add in effects as you play! Then there's a dock, appropriately called the iCade that looks like an old school arcade game. For you gaming enthusiasts there's the iDrift - an accessory that turns your iPad into a steering wheel-shaped joystick to play your favourite racing games. 



THE FUTURE OF TABLETS

A pple has set the form factor that will probably be with tablets for a long time to come. The brilliant thing about its design is that the iPad doesn't really have a design. The current big-slab-of-glass is a really good example of an unobstructive design. It is where the device takes a backseat and you have this slab of glass that becomes a platform for you to do different things using apps. This slab becomes what you need it to. So, this form factor is here to stay for some time. It is the evolution under the hood that we will look at in the first part of this chapter. In the second part, we will look at the inevitable evolution of tablets due to new different case scenarios, and due to the introduction of new technologies.

Near Future - Empowering the slate Display

The display is what matters the most in a tablet. It is the only part that the user interacts with, or can interact with. Improve the display, and you improve everything.

Resolution

Like most other things in the tablet world, the new iPad has set the standard here - 2048x1536 pixels packed into a vibrant 9.7-inch IPS LCD screen. In terms of resolution, this might well be a ceiling at this size. In the coming year, we will see other companies doing their best to catch up with these numbers. They probably will, but we only hope they take lesser time than they took catching up with pixel density on the iPhone 4. But pixels are just half the story.

Display Technologies

The screen on the new iPad looks as brilliant as it is sharp, but we definitely know that there are technologies out there that can outmatch it. The backlight-less AMOLED screens from Samsung are much more power efficient and deliver lusciously dark blacks. Giving a Super-AMOLED+ this huge pixel density could create a display that might dethrone the iPad's.

Another display technology for the future is colour e-ink, and there is speculation that Amazon has already ordered a batch of E-Ink's Triton colour e-ink displays for its next generation of e-readers.

3rd Dimension?

At some point of time, some company will come up with a tablet sporting a glasses-free 3D display a la Nintendo 3DS. While the lack of content has caused 3D-touting smartphones to flop badly, the bigger display on tablets might just save the Nth reincarnation of 3D. This is majorly because a lot of movies are already available in 3D, and the tablets might just offer a more tempting display than smartphones to watch these. And if the trend catches up, other content will surely follow suite.

Screen Coating

No matter how good the screens are, it all becomes useless when you have a distracting oil smudge or a bright reflection. While matte screens (or screen protectors) are an alternative for some, we think the higher contrast ratio on glossy screens means that no manufacturer would dare ship a tablet with a matte screen. Luckily, there are alternatives that reduce reflections and smudges without resorting to matte.

Japanese chemical firm Toray has developed a special oleophobic layer with nano-wrinkles, which it showcased Nano Tech 2012 held in Japan in February. Unlike the largely ineffectic oleophobic coatings that the

current top-line of devices have, Toray's film does not rely just on the oil-repelling properties, but on the texture of these oleophobic coatings as well. The small 'nano-wrinkles' are invisible to the eye but they make the fingerprint less visible due to their structure, and the way it reflects light. So this film not just repels oil, but also decreases the visibility



Toray's film is coated on the glass piece on the right

of smudges. We are expecting other such technologies as companies look to reduce the distracting reflections and smudges.

Processor

The current tablets, and all other handhelds, run almost exclusively on ARM-based processors. Apple devices are all based on ARM architecture, and so were Android devices until very recently. This has been a tectonic shift of sorts, as Intel had dominated while desktops and laptops were hot. A part of the reason for this was that ARM processors have historically been much more power efficient. While Intel was going for clock speeds in excess of 3.0GHz, the slower-clocked and power efficient ARM processors were a perfect fit for the initial smartphones which never really had aspirations to compete with PC for power. Fast forward a few years, and we see a constant dip in PC sales year-on-year, and a constant increase in the processing power of ARM chips.

Intel would not give up without a fight, and has released a rather impressive first iteration of its mobile-minded processor architecture, Medfield. Android now supports the Intel architecture, and the initial benchmarks on the early handsets have shown that the age old adage of Intel processors being inefficient doesn't really hold true for the new architecture. Already, the single core Medfield is running neck to neck with quad-core ARM equivalents. So, looking in the glass orb, we can see Intel devices bringing more competition to the tablet space.

One of the most significant releases in the following year would be the ARM Cortex-A15 based devices. The flagship Cortex architecture is touted

to be five times more powerful than the current A9-based chipsets, and is still more power efficient. The new iPad was only not given an A15-based processor due to the manufacturing not being mature enough. The A5X chipset has juiced A9 to its limits, and we expect the next iteration to future a much more efficient and powerful Cortex A15 processor.

As of now, ARM dominates Android market, and Intel dominates the Windows PC market, but not only is Intel moving over to the Android realm, ARM is also getting an ARM-based version of Windows later this year. Therefore, we'd have Windows and Android tablets running on both ARM and Intel processors. The competition will only be good for the end users, and we can expect the processing capabilities to increase even faster in the future.

Haptic Feedback

One point often overlooked is how little the current generation of 'touch-devices' actually do for the sense of touch. While all components of mobile devices have advanced by leaps and bounds, notice how mobiles still use the same old dumb omnidirectional vibration motor since the lancient brick sized phones.

Intel Measured Smartphone Power Consumption (Identical Display Brightness)				
	Standby (3G)	Talk (3G)	Browsing (3G)	Video Playback 720p
Apple iPhone 4S	~38mW	~800mW	~1.3W	~500mW
Intel Medfield Reference	~18mW	~700mW	~1.0W	~850mW
Samsung Galaxy S II	~19mW	~675mW	~1.2W	~650mW

One of the companies aiming to change this scenario is Immersion Corporation. With their software already having being shipped in 400 million electronics devices, chances are that a mobile device you currently own already has software my Immersion Corp. in it. But even with the most sophisticated software, the current hardware in phones limits the haptic feedback. Current phones ship with vibrational motors that require time to start and stop. Immersion's HD Haptics platform, released earlier this year, provides 'High Definition' haptic feedback if the manufacturers replace the motors with piezoelectric actuators. Piezoelectric actuators

have almost zero startup time, and add a premium of just \$1-2 per device. Such a device would provide localized haptic feedback which would let you feel, for example, a ball bouncing and striking the sides of a screen. In real applications, this could be even used to provide specific feedback for certain reminders, or an email from an important contact. And of course, the possibilities are endless as far as games are concerned.

While actuators use vibrations, another way that researchers have been trying to provide haptic feedback is by creating textures on the screen. Imagine feeling a button on screen as you run your hand over it. One company that has already demonstrated such a product is Senseg. Founded in 2008, the company has created a tactile technology that uses electrostatic fields to exert different levels of force on the fingertip, and thus simulates the sensation produced by different surfaces. So, when the devices debut, it would allow you to feel and recognise everything from sand to bubble wrap just by touching the screen. While Senseg's technology will work with all the current panels, there is another company that is working on special screen to create the same virtual texture.



Senseg's haptic feedback

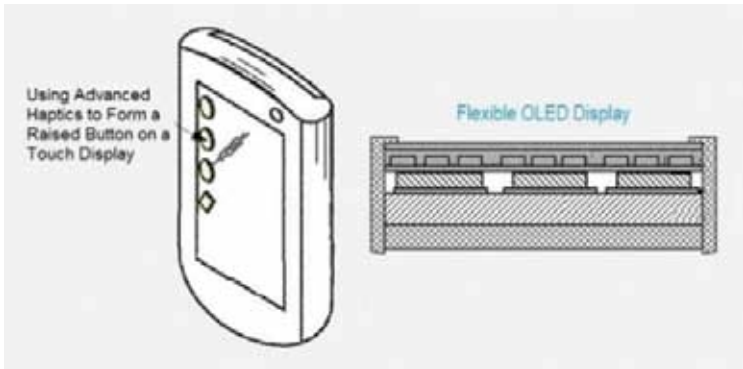
In early May this year, an Apple patent emerged that proposes the use of multi-tiered elastic screen to create raised buttons and other identifiable textures and patterns. While Senseg's technology just simulates these textures, Apple's patent proposes actual creation of these crests and troughs using flexible OLED. It remains to be seen what version of iPhone/iPad will actually see this tech, but the possibilities are extremely exciting. It might also put to rest the eternal debate over physical keyboards.

Evolution of the slate

Projection and Tablets

Over the last few years, we have seen a rapid increase in screen sizes, which is like a reversal of the trend of miniaturisation that happened before that. The tablet itself is the child of this trend as people looked beyond smartphones for the consumption of the new high definition content on a more spacious screen.

But can you have a full sized slate with the convenience of the mobility of a smartphone? Projection based slates are already here, and are one of the things we are most excited about. One product that is already in existence is Light Touch, by Light Blue Optics. Light Touch creates a 10.1" touch screen on any flat surface using a projector, and then processes the touch input using a camera and other sensors. Such a technology could blur the lines between a phone and a tablet. You could have a pocketable phone for working on the go, and the moment you have a solid surface nearby, you can turn the phone into a projected tablet. It could well be the future of tablets. While the current size of the projection is just 10.1", bigger sized projection tablets are obviously going to come to the market eventually.



Apple's patent application

Flexible Tablets

We dream of more mobility on our tablets. To be exact, we would like to pocket them. Fold them, roll them, or just ball them up and put them in our pocket.

With almost all major display manufacturers working on flexible displays, our fantasy might just come true sooner than we expect. Samsung

has already started pre-orders from industries for its flexible OLED display 'Youm'. The odd-sounding display is actually going to ship by the end of this year. But will we pocket a tablet by the end of this year? Probably not.

The current generation of flexible displays are 'flexible', not 'foldable' yet. They can bend to a good degree, but cannot be folded into two. Not yet. Instead, the current displays would be very good for devices where you need a ruggedness. Made of polyamide (a type of plastic), these displays



Light Touch projector

will not shatter like the glass displays of today.

It must also be noted that to actually have a foldable device, you also need to have foldable silicon. Although such foldable printed circuits have been around for a while, they are still very primitive. In February 2011, a group of European researchers led by scientists from Belgian nanotech research center 'Imec' introduced the world's first foldable microprocessor made with organic semiconductors. The 8-bit microprocessor had only 4000 transistors and is a far cry from today's advanced microprocessors with millions of transistors. But even if it has the power of a 70s processor, it is a beginning nonetheless. Pairing this flexible circuitry with equally flexible displays is one thing that is definitely going to happen in the future.

Hybrids

No talk about hybrids can now begin without reference to Tim Cook's now popular comment at the latest quarterly earnings conference call by Apple:

"Anything can be forced to converge. The problem with that products is you begin to make trade-offs to an extent that pleases no one. You can



Samsung's Youm display

converge a toaster and a refrigerator, but those things are probably not gonna be pleasing to the user.”

Yes, Mr. Cook, we would not like a toaster and a fridge. But then there are people who really wouldn't like to carry a laptop, a tablet and a mobile at the same time.

Of the infinite things we can combine a tablet with, we are only going to concentrate on phones, laptops and toasters. Ok, not toasters.

Phablets

At times, there is a very thin line between a tablet and a phone. Probably the two biggest advantages of tablets over phones are a bigger display, and a longer battery life. And companies have tried to bring these advantages to phones without the need of carrying two devices. The phablet was born.

As far as combination of phones and tablets is concerned, we have two approaches so far. The simpler of those already exists in the market: make the phone so huge that it starts resembling a tablet. Exhibit A - the weirdly popular Galaxy Note. When this phone/tablet/whatever came out, it was ridiculed by many but a large number of people in India and across the world have purchased more than 5 million of this pocket burster. The reasons for popularity of the Note and other phablets that might come out in the future are obvious: Big high resolution screens, possibility of a better battery life, and the biggest of them all - better pocketability than full sized tablets. But

the lines between a phone and a phablet of this type are already blurring with the latest smartphones already touting displays as big as 4.85 inches.

Another approach is something we have seen in the Asus Padfone. The oddly named device, whose launch video is amongst our favourites, has a slot at the back of a processor-less tablet, where you can dock the phone. The processor in the phone powers this skeletal tablet which only has a battery inside it to charge the phone when it is docked. The added advantage with Padfone is that you can also attach a keyboard dock to convert it into a notebook. Phablet+Laptop. Phabtop, anyone?

Tabtops

Merging the laptop and the tablet is a much more sensible scenario because the major difference between the two is often the pain point for many tablet users: a physical keyboard. ASUS's Transformer series of tablets comes with its own line of docks which convert them into a laptop. While it is excellent for battery life, it adds very little value otherwise. Android really can't act as a laptop replacement as it does not support the productivity apps that make a Windows PC indispensable. But this will change with the release of Windows 8. The tablet/laptop hybrid will make even more sense with the new touch oriented version of the popular OS.

Augmented Reality tablets

We are now venturing into distinct concept device territory, but with a device that is as likely to happen as all the combinations we have speculated above.

One of the changes that has been evident in the last decade in computing is how services have evolved and become more and more people centric. The social aspect invades every technology as more and more services revolve around us, our friends and our surroundings.

It is with this at the back of our mind that we visualise this tablet of the future, where the solid slate could be




ASUS's PadFone

replaced by a transparent display (such displays have already been exhibited by Samsung earlier this year). You can look through this tablet and see contextual information. Eg. You look through the tablet at a book and see the synopsis and reviews for that book. You look through this tablet and it overlays GPS information on the road to instruct you to the place whose advertisement you just looked at through this wonder device. It can display dialogue bubbles to show the social networking updates of your friends by using advanced face recognition technology.

What we have imagined is not very different from the recently showcased Google Glasses project, but a tablet presents an interface to display a much richer information and also lets you interact with it better. Note that what we have imagined above is definitely possible with the ordinary tablets of today, but they'll need to be fitted with cameras that have a super high resolution paired with a super high refresh rate!

A Final Say

Tablets are going to be a very important part of our future. They are here to stay. Just because the iPad was released by Apple after the very successful iPhone, people often termed tablets as huge phones. But we'd rather say that tablets have evolved from laptops. The 'artificial' interaction medium of keyboard and mouse has given way to a much more natural way of interaction in the form of touch. Consider a kid - he'd much rather flip a book to browse through it, and was definitely not born with inherent knowledge about the 'PageDown' key. But there is much more that the tablets need to do before they become natural extensions of our self. Believe us, they eventually would. 





TIPS

Now that you know all you need to about tablets, we're going to assume you've rushed out and bought yourself one – in about the same time it took you to flip from the last page of the previous chapter to this one!

Android Tablet Tips

See the normal web

Android's phone-based heritage means many web sites see it come and serve up mobile versions of their content that looks terrible on a 10-inch screen. You can get around this by changing the way the browser identifies itself – go to the browser settings (top right-hand corner of the screen), and tap Advanced and change the 'User agent string' to desktop or tablet. Not all tablets have the user agent option available. Acer's Iconia A500,

for example, needs a bit of a hack. Open up the browser and type 'about: debug' into the address bar. Now when you go to Settings, you should see a menu for 'Debug' - the user agent switch is in here.

Speed up web browsing

The beauty of Android is that it can handle Flash-based web content. But web sites with lots of interactive banner ads will still slow it down. Go to **Browser > Settings > Advanced** and change 'Enable plug-ins' to 'on demand'. Flash applications will appear as an arrow you must click to start them off.

If you notice a lag when entering text in dialog boxes in the browser, a setting can be changed that helps eliminate the lag.

Once the hidden debug menu has been activated as detailed in a previous slide, simply deselect the Enable OpenGL Rendering option as displayed. While this doesn't help all web sites render faster, it works for some of them so try it on an as needed basis.

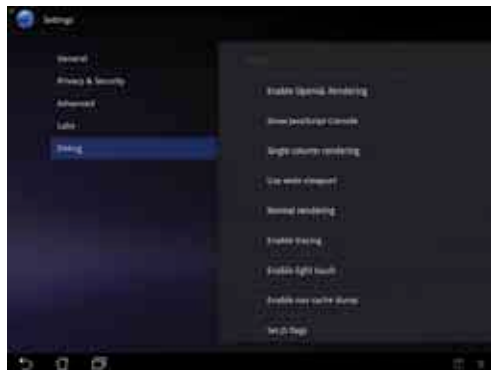


Search by voice

Another shortcut you may not have noticed is the microphone icon next to the search bar on the main homepage. This opens up Google's Voice Actions, which lets you control your tablet or search the net without using your hands.

Find network shares

Android's built-in File Manager is OK, so long as you can wrap your



head around Linux's unusual way of structuring its hard disk, but for some reason Google decided the ability to browse shared folders on your network was an optional extra. Download File Expert from the Market instead.

Sync your bookmarks with your desktop

If you use Chrome as your desktop browser, one of the big advantages of Honeycomb is that you don't need an app like Xmarks to sync your bookmarks. It's all done via Google's sync tools, hidden on **Preferences > Personal Stuff** on the desktop version of Chrome and **Settings > General** in Honeycomb's browser.

Filter the apps menu

Hunting for a particular app and don't know where you installed it? You may not have spotted this, but if you open up the full list of installed apps by touching the menu button in the top right of the desktop, there's an option to show 'All' or 'Downloaded' at the top of the screen.

Use your phone as a modem

There's some confusion over whether or not Honeycomb supports tethering in the normal manner. The good news is that yes, it does. Go into **Settings > Wireless & Networks > Bluetooth** turn on Bluetooth and pair it with your phone. Now click the spanner icon next to the phone's name in the list there, and you'll find an option for internet tethering.

Encrypt your data

One of Honeycomb's killer features for business users is the ability to encrypt the built-in storage, so if someone takes off with your tablet they can't pull your data off the hard drive. You'll need to fully charge your battery and set a password or pin number to the lock screen, then go to **Settings > Location and Security**

Make your battery last longer

Goto **Settings > Wireless & Networks > Wireless Settings > WiFi Sleep Policy**, and change it to 'When screen turns off'. That'll disconnect the wireless antenna while the tablet is in standby: you won't get new email alerts, but your battery will last for days.

Add folders to your desktop

Why did Google remove the ability to create desktop folders for apps in Honeycomb? It's there in Froyo *et al.* must be because they thought five

huge home screens was enough space – but it's not. Get Smart Shortcuts from the Market and organise your workspace the way you want.

For advanced controls, there's Labs

Since Honeycomb, the Android browser has included a Labs area for providing advanced functionality. One such function is the enabling of quick controls, as shown on the right side of the displayed web page (blue wheel).

Once activated in the Labs, the entire screen is dedicated to displaying web pages. To access the wheel, simply swipe in from either the left or right edge of the screen. Hold



your finger in place once the wheel appears, and slide it over the desired control. When you raise your finger the selected function is executed.

Fire up the browser and go to **Settings > Labs** and you'll notice an option for 'Quick Controls'. This gives you a little thumbwheel at the side of the page for navigation and will be turned on as standard in the next update.

Quick link to Dropbox folders

Dropbox is a useful service for storing files either as a backup or to share with others. On any home screen tap and hold an empty spot, or hit the big + button at the top right of the display. This opens up the home screen customisation display. Hit the More tab and you'll see an icon for Dropbox folders. Hit that and select your Dropbox folder you wish to have access to on your home screen. Once the icon has been put on a home screen, it can be positioned as desired just like any icon on the home screen.

Capture information with the Evernote add-on

The Android browser is pretty good, but the free Dolphin Browser HD (available in the Android Market) is the best mobile browser on any platform. It has a long list of features that set it ahead of the pack, and one of the most useful is the ability to use add-ons like many desktop browsers.

Evernote can be used to capture information during research, and the free add-on for the Dolphin Browser makes that as easy as tapping an icon

on the screen. The web page is saved to Evernote notebook in the cloud, accessible on any device one must be using.

Uninstall apps the easy way

If you've used Android before, you might recall that uninstalling apps is a bit of a laborious trawl through the settings menu to find the right control panel. In Honeycomb, just open up the full launcher, then drag and drop app icons to the trash can to fully remove them.

iPad Gesture Tips

One of the significant highlights between the iPad and Android tablets out there is the fluidity with which you can hop across apps and all of it with some really simple gestures, as follows:

Switch between open apps

When running an app, you can minimise it by simply clicking the Home button. Getting back to it is not just one click on the taskbar like the way you do in Windows. But the iPad way is not difficult either.

To turn on Cap Lock:	Double-tap the shift key. The key turns blue to indicate its locked.
To open Magnifier (Loop):	Tap and hold on the text.
Type a different domain suffix:	Hold down the .com button, a popup will appear with .net and .org buttons, slide your finger to the one and then release.
To type alternate characters:	Hold down a letter on the keyboard, a popup with various versions of the character will appear slide your finger to the one needed and release.

Call a phone number from Safari	Tap the phone number and it will dial it.
Get URL Hint	Tap and hold a link to see the actual URL and the page title of the linked page.
Scrolling webpages	Use one finger to scroll the entire webpage. Use two fingers to scroll a frame on a webpage.

Quickly scroll to the top (of a webpage, mail message, etc.)	Tap the status bar at the top of the screen.
Open Spotlight page(to do a global search)	Swipe to reveal the page (to the left of the 1st home screen) or press the Home button while on the 1st home screen.
Start Voice Control	Press and Hold the Home button for a few seconds and Voice Control will appear.
Quick access pause, volume, skip buttons, etc while in other apps, including the lock screen	Double click the Home button, in iOS 4 or later, the app switcher will appear. Swipe to the left (drag finger from left to right) to see the controls and a Screen Orientation Lock.

On the iOS 4 or iOS 5

- Double-click your iPad's Home button to reveal the open apps on the multitasking bar at the bottom of the screen.
- Flick left to see more running apps.
- Tap an icon to instantly switch to an open app.

On the iOS 5 only

- You can use four or five fingers to swipe left or right to switch between open apps, or swipe up to reveal the open apps on the multitasking bar.

How to Pause an App Install

If you're downloading or updating more than one app at a time from the App Store, it shows the first one as "Loading...", and the rest "Waiting..." But some apps can be very big and take time to download, and you need to get the one waiting to download first. That's easy:

- Tap the one which is loading, it will then be paused and the next one waiting in line starts loading.
- Repeat the same to the rest until the one you need to start loading.
- You can also tap the one which has been paused to start waiting, or loading when no others are loading or the rest are paused.

How to Type Faster with Multiple Spaces

Instead of typing a period at the end of each sentence and follow by a space, you can double-tap the space bar, or tap once with two fingers, to get the same result.

Ironically the iPad soft keyboard doesn't have a Tab key, but you can tap the space bar with three fingers at the same time to get three spaces, or four fingers to get four spaces. It works for five spaces too if you put five fingers together to press the space bar.

How to Type Smiley or Emoji Characters (iOS 5 only)

Now you don't need to rely on third party software to type smiley or emoji characters as the iOS 5 includes a built-in Emoji keyboard, which you can enable.

- Go to Settings > General > Keyboard.
- Tap "International Keyboards" and "Add New Keyboard"
- Select "Emoji".

To type a smiley or emoji character, tap the "International" key on the keyboard (or touch and hold the key, then slide to Emoji), a plethora of emoji characters are then at your fingertips.

How to Turn Off Auto-Correction

When you're typing through, the system checks your spelling and suggests a word. Unless you've rejected it by tapping the x button, the suggested word overwrites your word when you finish typing it followed by a space, punctuation mark or return character. If you feel that's annoying, you can turn off Auto-Correction.

- Open the app Settings and select "General" on the left panel.
- Select "Keyboard" on the right panel.
- Turn off "Auto-Correction".

Note: As an alternative, you can opt for an audio alert whenever the system suggests a word using the "Auto-Correction". To do so, go to Settings > General > Accessibility, and turn on "Speak Auto-text".

How to Print Screen

Where's the PrintScreen button when you need to take a screen shot of your iPad? Instead of using one button, try a combination of two:

- Press and hold down the Sleep/Wake button at the top right corner of your iPad, and click the Home button.
- Open the app Photos, and you can see your screenshot already saved in the Camera Roll album.

How to Set up Mail Accounts and Sync Options

The iPad allows for adding multiple mail accounts including GMail, iCloud

(in iOS 5), Exchange, Yahoo, Hotmail and others. To set up a mail account is straightforward especially for this example, Gmail.

- Open the app Settings and select “Mail, Contacts, Calendars” on the left panel.
- Tap “Add Account”, select Gmail, and then enter name, address and password.
- Tap “Next” for verifying.
- Leave the sync settings “On” for Mail, Calendars and Notes, tap “Save” to finish.

After this setting, you can then open the app Mail to send emails and read incoming mails, check and edit entries in the apps Notes and Calendar, which are automatically synced with your Gmail account over the air.

How to Send Instant Messages (iOS 5 only)

Becoming a competitor to BlackBerry Messenger, iMessages developed by Apple gives you a real-time instant messaging service via Wi-Fi or 3G for all iOS 5 users. To use this service and send an instant message from your iPad is pretty straightforward.

- Tap the Messages app icon.
- Tap the plus sign and add a contact, which will be identified by the service if running the same app.
- Add text, photos or videos and tap the Send button.

The service supports group messaging, tracking with delivery receipts and encryption of messages.

How to turn your iPad into a Digital Photo Frame

With the default Photos app, you can easily slideshow your collection of photos, with options for transition effects and music. But even before you unlock your device, you can turn your iPad into a digital photo frame—just tap the “Picture Frame” icon (see the screenshot) and enjoy. Can you show each photo faster or slower? Yes. Open the app Settings, select “Picture Frame” on the left panel, then on the right panel, select a time interval you need. You can also choose a transition effect, select zoom, shuffle and albums.

How to Access Notification Center (iOS 5 only)

Just like the current Android system, the iOS 5 now allows you to quickly access a notification by swiping down from the status bar at the top of the screen, saving you the trouble of finding alerts on the app icons in various home screens.

- To clear a pending alerts right away, press the X sign where available, and then the “Clear” button.
- To access a notification, tap it and you’re taken to the related email, reminder, message or app. The notification then clears automatically from the Center.

Better still, you can customize notifications the way you want from Settings > Notifications.

How to Use a Keyboard Shortcut (iOS 5 only)

Need to type and re-type certain phrases over and over again? Then why not use a keyboard shortcut so that you type faster and it saves your time. This feature is available in iOS 5 and you can set a keyboard shortcut easily.


- Go to Settings > General > Keyboard.
- Tap “Add New Shortcut”
- Enter a phrase, e.g. in my opinion
- Enter a shortcut, e.g. imo
- Tap “Save”.

The next time you type a shortcut, e.g. imo, the system will suggest expanding it to a phrase that you’ve set.

How to access Brightness

The iPad screen is extraordinarily bright, this is wonderful for daytime use but give your eyes some rest in dimmer environments and at night time by manually adjusting the brightness, just double-tap the Home button and swipe right until you see the brightness indicator, and adjust manually as the lighting fits.

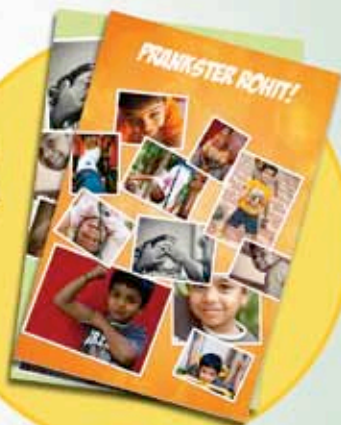
How to selectively prevent automatic sync

Sometimes you don’t want to sync your iPad when you connect it to your computer. In that case, hold down Shift-Ctrl (or Command-Option, on a Mac) in iTunes while plugging your iPad in, and iTunes will skip the automatic sync just this once. Alternatively, you can safely interrupt a sync by dragging the unlock slider on your device while the iPad is midsync. 



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